# ELECTRICAL REVIEW

A WEEKLY JOURNAL OF

ELECTRIC LIGHT, TELEPHONE, TELEGRAPH AND SCIENTIFIC PROGRESS.

(Formerly Review of Telegraph and Telephone.)

Vol. 2, No. 13. WEEKLY. | NEW YORK, THURSDAY, JUNE 7, 1883. | $3 per Annum. Single Copies, 10 Cents.


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Entered at Post Office, New York, as Mail Matter of the Second Class.

## THE COMING EXHIBITION AT VIENNA.

### An Authentic Description of the Building Wherein it will be Held.

THE GRAND ROTUNDA—THE POSITION AND ARRANGEMENTS OF THE ARC LIGHTS—THE INCANDESCENT LIGHTS—A COMPARISON OF THIS BUILDING WITH THAT OF THE MUNICH EXHIBITION BUILDING, THE PALAIS DE L'INDUSTRIE AT PARIS, AND THE CRYSTAL PALACE AT LONDON—EIGHTY PER CENT. REDUCTION IN FREIGHT CHARGES FOR GOODS EN ROUTE—ADMIRABLE ARRANGEMENTS OF THE MANAGERS.

It has been the object and aim of the ELECTRICAL REVIEW to furnish to its patrons, at the earliest possible moment, the freshest intelligence of electrical enterprises, in no matter what part of the world they are set afoot. Neither trouble nor expense has been spared in the furtherance of this design.

When Dr. Green, the president of the Western Union Telegraph Company, was entertained in London by Mr. John Pender, M. P., the ELECTRICAL REVIEW published a cable report of the proceedings simultaneously with its London contemporaries, and anticipating its American contemporaries by eighteen days.

In furtherance of this policy we herewith present to our patrons a correct representation of the Electrical Exposition building in Vienna, Austria, where the grand international display of electrical contrivances is shortly to take place. This vast structure is admirably adapted for the purpose of an international exhibition. The design of the rotunda, with its almost numberless adjoining apartments, makes it certain that every exhibitor will find at his disposal ample opportunity for an effective and advantageous display of his goods. Besides the central building, which has an area of 12,900 square meters, there are, as the reader will see by carefully examining the illustration, four additional transepts, three galleries, *i. e.*, the west, north, and east, having together an area of 6,750 square meters, and two large courts with 6,600 square meters; giving a grand total of nearly 30,000 square meters for the display of electrical apparatus.

If we compare the rotunda of this structure with similar buildings in other countries, its superiority becomes evident. Thus, in the *Palais de l'Industrie* at Paris, wherein the first electrical exhibition was held, there is a surface of 29,264 square meters, of which only 20,368 square meters were situated in the *Rez de Chaussée*, the remaining 8,896 square meters being located in the second story, whereas in the Vienna rotunda the total area is on the same level.

The Munich glass palace contained a disposable surface of 10,048 square meters, not even as much as that within the interior space of the rotunda at Vienna, and about the same amount of space was devoted to the electrical exhibition in the Crystal Palace in London.

Again, the vast walls of the Vienna exposition building, together with their great height, will permit of a grand display of the electric light in all its phases and features. Fully twenty-four meters—more than seventy-two feet—from the level of the rotunda the first set of lights will be hung; the second set at a height of forty-eight meters—more than 144 feet; and the third at a height of sixty-six meters—more than 198 feet. This lantern gallery, so called, could not have been better adapted for the display of the various systems of electric lighting.

The committee having charge of this portion of the exhibition have decided upon the following arrangements of lights: At the apex of the lantern gallery there will be hung an arc lamp of an estimated power of 20,000 candles. This will be so arranged as to send a perfect shower of light downwards. In the upper and smaller gallery there will be a wreath of light composed of twenty-eight arc lamps, each of from two thousand to three thousand candle power. Upon the lower and larger gallery there will be one hundred and twelve arc lamps, each of about one thousand candle power, and in addition to this there will be on the ground floor of the rotunda thirty-six arc lamps, each of five hundred candle power.

INTERIOR VIEW OF THE INTERNATIONAL ELECTRICAL EXPOSITION BUILDING.

In each of the twenty-eight arches of the half gallery arc lamps of eight hundred candle power will be hung. Thus there will be a grand total of fifty-six arc lamps pouring their streams of light into the rotunda, the total amount of their intensity being equal to the enormous number of 265,000 candles.

In all the galleries, transepts, and courts thousands of incandescent lights will be hung in all the various forms of glass, and in variously colored glass globes.

The innumerable outer courts, rooms, and halls will contain in all two hundred and

forty-seven additional arc lights, each of one thousand candle power.

In the immediate vicinity of the electrical building there are a number of prominent and imposing edifices, and these will be electrically lighted by means of a current of electricity generated in the exhibition building. Adding the sum of these lights to that already computed as the sum of the exhibition lights, the grand total of electric light intensity exhibited within the exhibition proper, and transmitted electrically to neighboring structures, of not less than six hundred thousand candles—a sum which is said to surpass five-fold the amount of gas-light used in Vienna and its ten districts, for this has been computed to be only one hundred and twenty thousand candles.

A part of the great rotunda will be specially set aside for an exhibition of the various systems of telephonic apparatus, and wires will be run to great distances from the exposition building in order that a careful and thorough test may be made of the efficiency of each.

An electric railway will be established for each of the well known systems, *i. e.*, the independent electric motor with storage batteries under its seats, the charged rail system and the suspended wire system. This furnishes an exponent of the policy which is to be pursued by the Commissioners who are to manage the exhibition.

We have been officially informed by the Austrian-Hungarian railway administration of its intention to grant reductions of freight on all objects sent to the electric exhibition, which, according to the various tariffs on piece goods, will amount to a reduction of from 70 to 80 per cent. Besides this a full insurance will be allowed on all objects sent to Vienna for display at the exhibition, and a certificate issued by the Commission, and added to the bill of lading, will establish the standing of the owner of the goods.

Arrangements are now making with the railroad companies of other countries looking to a corresponding reduction in freight charges for goods *en route* to the exhibition.

In order to present to the visitors of the international exhibition the literature of all countries on the subject of electro-technique and applied electricity, the Commission of the exhibition has entered into an arrangement with a large publishing firm in Vienna, whereby the electro-technical literature of all countries may be gathered together in convenient forms.

An extensive library will thus be formed, in a room adapted as a reading-room and lighted with electricity. Of every book bound exemplaries will be placed in bookcases, as exhibits, and exemplaries may be used without charge. Thus the visitor will not be compelled to rely for his information concerning the various systems upon the answers elicited from busy officials and exhibitors, but, as every exhibit will be marked, he may turn to his own book, or one of those on the library shelves, and there, at the corresponding number, find everything concerning it explained and illustrated, and this, too, in his own language.

This is an admirable idea, and could only have been thought out by men of intelligence and experience in great exhibitions.

At most of the exhibitions we can recall, certainly all the more recent ones, one could see anything and everything; but to learn the theory upon which any particular apparatus was based, to obtain details of its economy and of its cost under various circumstances, he could not, though doubtless all this was set forth in the miscellaneous collection of tracts scattered about the place of exhibition. But the fact is that few persons have either the time or desire to search through a bundle of pamphlets and unassorted papers for the description of something, which possibly may be of no service to them if found, because written in a foreign language.

It is, therefore, an admirable design to collect everything of this kind into uniform books, printed in all languages, so that the most casual visitor may, without trouble, be enabled to turn to a description of anything that may peculiarly interest him.

### Faure's Secondary Pile.

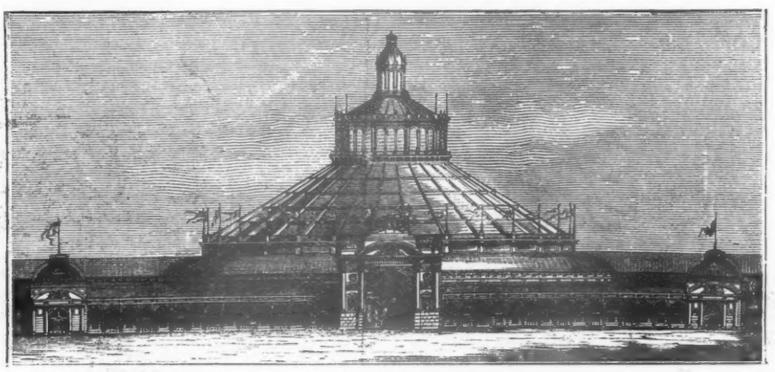
In Planté's battery the formation of the current is limited by the thickness of the leaden plates. Faure gives to his couples an almost unlimited power of accumulation, by covering the electrodes by a layer of spongy lead. In a pile of seventy-five kilogrammes he is able to store a quantity of energy sufficient to furnish a horse-power for an hour.

### Experiments upon Electric Lamps.

The French committee have reported the results of their experiments with the Jablochkoff, Debrun, and Jamin lamps, when run by the Debrun, Gramme, and Meritens dynamo machines. They find that the different lamps and machines produce economical results which are almost identical, whether measured by the amount of light furnished per horse-power or by the electric efficiency of the light.—*Comptes Rendus.*

### Origin of Thermo-Electricity.

The thermo-electric batteries, and especially those of M. Clamond, had raised large expectations because the corrosion of the solderings was attributed to heat alone, and it was hoped that it might be remedied. Exner has just shown that it is due to oxidation by the air, aided by the heat; and that if this action was prevented, by the use of nitrogen, for example, the electric current would not be formed. Thermo-electric batteries are, therefore, simply gas-batteries, in which certain gaseous fluids act in a similar manner to acid liquids.—*Chron. Industr.*



Exterior View of Vienna Exhibition Building.

### Coloring Jewelry by Galvanism.

Fr. Weil has exhibited to the French Academy various articles of jewelry, which were colored by metallic layers deposited by electro-chemical processes. The colors have a great artistic value and are very durable, resisting friction, moisture, sulphuretted hydrogen, vapors of ordinary burning gas, and the action of light. Edmond Becquerel recalled the experiments of his father, in coloring metals by means of thin layers of oxide of lead and oxide of iron. He obtained very brilliant shades of various colors, and he found that by increasing the thickness of the layers, he could effectually protect metals from rust.

### Underground Electric Cables.

Chicago, June 1.—The backers of the Chicago Underground Electric Company are seeking to secure an ordinance granting permission to lay cables under ground in the streets. The cable controlled by this company consists of five copper wires covered with insulating material and surrounded by lead. No conduit is required. The cables simply being laid in a trench under ground. The process of manufacturing the cable is similar to that of making lead pipe.

### A Cable for Sale.

We extract from the *City Press* of London the following:

"Tokenhouse-yard is to witness a remarkable lot under the hammer on the 22d inst., and from the fact that it lies electrically inert at she bottom of 'the deep blue sea,' and may have served the mermaids for a skipping rope, or possibly a crinoline, to say nothing of what uses Father Neptune has found for it, Mr. George Robins, of immortal memory, would have had a subject to his own heart for giving reins to the pleasures of the imagination, were he alive to handle the hammer in connection with such a novel subject of competition. The lot in question is none other than a submarine telegraph cable extending from Para, in Brazil, to Cayenne, in French Guiana, and to Georgetown, in British Guiana. There is something delightfully speculative about this prospect of investment beneath the foaming billows, especially as the Court of Chancery, with a fine regard for fairness, only promise to secure to the purchaser the cable as it now actually exists, while the particulars expressly set forth that it has not been for some time in use. Morever, with a delicious frankness—for whenever was a house announced to have had its drainage out of order, or smokey chimneys when last occupied?—this mysterious link beneath the ocean wave 'is believed to have been defective when last used.' Those who assemble at the Mart to see what bold investor in submarine telegraphy will be forthcoming, might, it is certain, wend their way to Tokenhouse-yard for an indefinite period before they again have particulars of sale brought under their notice containing so little in the way of piling on the agony in florid description of possible advantages.

### The Spelter Production of Europe.

In a sketch of the history of spelter, Herr C. von Ernst, of Vienna, has collected the following statistics of the production of spelter in Europe, which shows the growth of that industry. The unit is the metric ton.

| | 1858. | 1881. |
|---|---|---|
| Silesia | 38,000 | 67,547 |
| Rhenish Provinces and Westphalia | 15,400 | 32,520 |
| Belgium, Vieille Montagne | 27,000 | 49,600 |
| Other Belgian works | 9,500 | 44,211 |
| England | 7,500 | 15,186 |
| France | 500 | 10,445 |
| Spain | 1,500 | 7,032 |
| Austria | 1,050 | 4,236 |
| Russia | 1,500 | 4,300 |
| Total | 101,950 | 205,071 |

A $300,000 electric light company will soon erect a plant of machinery for the manufacture of the McTighe machine, as well as the light. This is a new and highly commended process.

### Electrical Units of Measurement.

By Sir William Thomson, C. E., London.

The lecturer began by observing that no real advance could be made in any branch of physical science until practical methods for a numerical reckoning of phenomena were established. The "scale of hardness" for stones and metals used by mineralogists and engineers was alluded to as a mere test in order of merit in respect to a little understood quality, regarding which no scientific principle constituting a foundation for definite measurement has been discovered. Indeed, it must be confessed that the science of strength of materials, so all important in engineering, is but little advanced, and the part of it relating to the quality known as hardness least of all.

In the last century Cavendish and Coulomb made the first advances towards a system of measurement in electrical science, and rapid progress towards a complete foundation of the system was effected by Ampère, Poisson, Green, Gauss, and others. As late as ten years ago, however, regular and systematic measurement in electrical science was almost unknown in the chief physical laboratories of the world; although as early as 1858 a practical beginning of systematic electric measurements had been introduced in the testing of submarine telegraph cables.

A few years have sufficed to change all this, and at this time electric measurements are of daily occurrence, not in our scientific laboratories only, but also in our workshops and factories where is carried on the manufacture of electric and telegraphic apparatus. Thus, ohms, volts, ampères, coulombs and microfarads are now common terms, and measurements in these units are commonly practiced to within one per cent. of accuracy. It seems, indeed, as if the commercial requirements of the application of electricity to lighting and other uses of every-day life were destined to influence the higher region of scientific investigation with a second impulse, not less important than that given thirty years ago by the requirements of submarine telegraphy. A first step toward the numerical reckoning of properties of matter is the discovery of a continuously-varying action of some kind, and the means of observing and measuring it in terms of some arbitrary unit or scale division, while the second step is, necessarily, that of fixing on something absolutely definite as the unit of reckoning.

A short historical sketch was given of the development of scientific measurement, as applied to electricity and magnetism, from its beginning with Cavendish, about 100 years ago, to the adoption of the absolute system of measurement by this country in 1869, at the instance of the British Association on Electrical Standards. The importance in this development of the originating works of Gauss and Weber was pointed out, as also of the eight years' labors of the British Association Committee. This committee not only fairly launched the absolute system for general use, but also effected arrangements for the supply of standards for resistance coils, in terms of a unit, to be as nearly as possible $10^9$ centimeters per second. This unit afterwards received the name of the ohm, which was adopted from a highly suggestive paper which had been communicated to the British Association in 1861 by Mr. Latimer Clark and Sir Charles Bright, in which some very valuable scientific methods and principles of electric measurement were given, and a system of nomenclature—ohmads, kilohmads, farads, kilofarads, volts, and kilovolts—now universally adopted with only unessential modification, was proposed for a complete system of inter-independent electric units of measurement. At the International Conference for the Determination of Electrical Units, held at Paris in 1882, the absolute system was accepted by France, Germany, and the other European countries; and

Clark and Bright's nomenclature was adopted in principle and extended.

Gauss's principal of absoulute measurement for magnetism and electricity is merely an extension of the astronomer's method of reckoning mass in terms of what may be called the universal gravitation unit of matter, and the reckoning of force, according to which the unit of force is that force which, acting on unit of mass for unit of time, generates a velocity equal to the unit of velocity. The universal gravitation unit of mass is such a quantity of matter, that if two quantities, each equal to it, be placed at unit distance apart, the force between them is unity.

Here mass is defined in terms of force and space, and in the preceding definition force was defined in terms of mass, space, and time. Eliminating mass between the two, it will be found that any given force is numerically equal to the fourth power of the velocity with which any mass whatever must revolve round an equal mass, fixed at such a distance from it as to attract it with a force equal to the given force. And, eliminating force between the two primitive definitions of the universal-gravitation system, it will be found that any given mass is numerically equal to the square of the velocity with which a free particle must move to revolve round it in a circle of any radius, multiplied by this radius. Thus, take a centimeter as the unit of length, and a mean solar record as the unit of time, and adopt 5.67 grammes per cubic centimeter as the mean density of the earth from Baily's repetition of Cavendish's experiment, and suppose the length of the seconds pendulum to be 100 centimeters, and neglect the oblateness of the earth and the centrifugal force of its rotation (being at the equator only $\frac{1}{289}$ of gravity) the result for the universal gravitation units of mass and force is respectively 15.36 French tons, and 15.36 dynes, or 15.07 times the terrestrial surface weight of a kilogramme.

The ultimate principles of scientific measurement were illustrated by the ideal case of a traveler through the universe who has brought with him on his tour no weights, no measures, nor watch nor chronometer, nor any standard vibrator or spring balance, but merely Everett's units and constants and a complete memory and understanding of its contents, and who desires to make for himself a metrical system agreeing with that which he left behind him on the earth To recover his centimeter the readiest and most accurate way is to find how many wave lengths of sodium light there are in the distance from bar to bar of a plating which he can engrave for himself on a piece of glass. How easily this is done, supposing the grating once made, was illustrated by a rapid experiment performed in the course of the lecture, without other apparatus than a little piece of glass with 250 fine parallel lines engraved on it by a diamond, and two candles and a measuring tape of unknown divisions of length (only used to measure the *ratio* of the distance between the candles to the distance of the grating from either). The experiment showed the distance from center to center of consecutive bars of the grating to be 32 times the wave length of yellow light. This being remembered to be $5.89 \times 10^{-5}$ of a centimeter, it was concluded that the breadth of the space on which the 250 lines are engraved is 250. 32. 5.892. $10^{-5}$, or .4726 of a centimeter. According to the instrument maker, it is really .5 of a centimeter! Five minutes spent on the experiment instead of one, and sodium flames behind fine slits, instead of open candles blowing about in the air, might easily have given the result within $\frac{1}{4}$ per cent. instead of $4\frac{1}{2}$ per cent. Thus the cosmic traveler can easily recover his centimeter and meter measure. To recover his unit of time is less easy. One way is to go through Foucault's experimental determination of the velocity of light.

But he must be imagined as electrically-minded, and he will certainly, therefore, think of "v," the number of electrostatic units in the electro-magnetic unit of electricity; but he will probably see his way better to doing what he wants by making for himself a Siemens mercury unit (which he easily can do, now that he has his centimeter), and finding (by the British Association method, or Lorenz's with Lord Rayleigh's modification or both), the velocity which measures its resistance in absolute measure. This velocity, as is known from Lord Rayleigh and Mrs. Sidgwick, is 9,413 kilometers per mean solar second, and thus he finds, in mean solar seconds, the period of the vibrator, or arbitrary-unit chronometer, which he used in his experiments.

Still, even though this method might be chosen as the readiest and most accurate, according to present knowledge of the fundamental data for recovering the mean solar second, the method by "$v$" is too interesting and too instructive in respect to elimination of properties of matter from our ultimate metrical foundations to be unconsidered. One very simple way of experimentally determining "$v$" is derivable from an important suggestion of Clark and Bright's paper, referred to above. Take a Leyden jar, or other condenser of moderate capacity (for example, in electrostatic measure, about 1,000 centimeters), which must be accurately measured. Arrange a mechanism to charge it to an accurately measured potential of moderate amount (for example, in electrostatic measure, about 10 c. g. s., which is about 3,000 volts), and discharge it through a galvanometer coil at frequent regular intervals (for example, ten times per second). This will give an intermittent current of known average strength (in the example, $10^5$ electrostatic c. g. s, or about 1/300,000 c. g. s. electro-magnetic, or 1/30,000 of an ampere), which is to be measured in electro-magnetic measure by an ordinary galvanometer. The number found by dividing the electrostatic reckoning of the current by the experimentally found electro-magnetic reckoning of the same is "$v$" in centimeters per the arbitrary unit of time which the experimenter in search of the mean solar second has used in his electrostatic and electro-magnetic details. The unit of mass which he has chosen, also arbitrarily, disappears from the resulting ratio. It is to be hoped that before long "$v$" will be known within 1/10 per cent. At present it is only known that it does not *probably* differ 3 per cent. from $2.9 \times 10^{10}$ centimeters per mean solar second. When it is known with satisfactory accuracy, an experimenter, provided with a centimeter measure, may, anywhere in the universe, rate his experimental chronometer to mean solar seconds by the mere electrostatic and electro-magnetic operations described above, without any reference to the sun or other natural chronometer.

The remainder of the lecture was occupied with an explanation of the application of the absolute system in all branches of electric measurement, and the definition of the now well known practical units founded on it, called ohms, volts, farads, microfarads, amperes, coulombs, watts. The name ohm, found by saying ohm to a phonograph and then turning the drum backwards, was suggested for a unit of conductivity, the reciprocal of resistance. The sub-division, millimho, will be exceedingly convenient for the designation of incandescent lamps.

The British Association unit has been found by Lord Rayleigh and Mrs. Sidgwick to be .9868 of the true ohm ($10^9$ centimeters per second). which differs by only $\frac{1}{8}$ per cent. from .9870, the number derived from Joule's electro-thermal measurements described in the British Association Committee's report of 1867, with 772 Manchester foot-pounds taken as the dynamical equivalent of the thermal unit from the measurement described in his Royal Society paper of 1849, and confirmed by his fresh measurement of 20 years later, published in his last Royal Society paper on the subject.

It is satisfactory that, whether for interpreting old results, or for making resistance-coils anew, electricians may now safely use the British Association unit as .9868, or the Siemens unit as .3413, of the ohm defined as $10^9$ centimeters per second.

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At Portrush a locomotive is used in addition to the electro-motive engine, but only temporarily.

## American Electric and Illuminating Company of Boston.

About a year ago one of Boston's intelligent and indefatigable workers hit upon a novel plan to organize and operate an electric light company. Novel because it was new.

Almost every company that had been organized before that date had patent electric light machines to sell. The management of these companies saw, as did most of those who have closely watched the operations of the various electric light companies, that it would be more profitable and perhaps more desirable for them to manufacture the dynamos, lamps and other essential machinery for central station "plants" and to sell this product of their mill and factory to local companies outright or with the guaranteed right to use the same handsomely paid for, partly in cash and partly stock, than to put in the plant and operate it themselves. This plan of the older companies worked well up to a certain point and proved very profitable to the parent companies who in most cases held considerable stock of the local organizations

In many cases, however, this local corporation through bad management and other causes failed to pay any dividends to their stockholders, and after raising and paying the money for their expensive plant found themselves about bankrupt without receipts and without resources.

In this confused state nothing could be done, and what had been to the populace a grand celebration—with a great deal of noise thrown in—proved finally to be a very bad system of electric lighting.

Seeing these and many other minor defects in the then accepted systems of electric lighting, Mr. Edward H. Goff decided to organize his new company, not to sell electric light machinery, but to put in the plant and electric lighting on systematic business principles. Having no favorite system, being tied up by no expensive patents of his own or any member of the company, he could choose freely from the best system open to the public. His selection was the best that could be made, as the results of their operations in New England so amply confirms.

The organization of the American Electric Illuminating Company took place in June, 1882, and on a broad-gauge principle, as this extract from their charter indicates:

"The objects for which this company is created are * * * the manufacture, use, application, purchase and sale of machinery, apparatus and appliances for the utilization of electricity for lighting, heating and power and other uses, and the licensing of the manufacture, use, application, purchase and sale thereof by other persons and corporations, as well as the acquiring, purchasing, holding, applying, selling and licensing of patents and other inventions and processes for the purposes aforesaid."

This explains itself. The company is now working the Thomson-Houston patents, and is licensed to use the same during the life of these patents.

But it occupies a very independent position in this respect, for it can, by the terms of its agreement, adopt any better or more useful system for any of its subordinate companies.

The position of the company, however, is a safe as well as an independent one, and while it will compel the manufacturing company to keep in the front rank of electrical progress, will also insure to its patrons the very best electric lighting that can be produced.

Though holding its patents from another company, the American Electric and Illuminating Company is itself a parent company for the lighting of cities, towns, factories, halls, etc. But it does not go about the country asking people to subscribe money and form a stock company to become tributary to it.

When it finds a place where people want the light and are willing to pay for the same it establishes a lighting station, fitting up the same fully and completely with all the machinery required, stretching wires and establishing lamps wherever needed, whether in streets or squares, or halls, stores or factories, without asking a dollar of assistance from any one.

If, however, when the station is established and in working operation, the people of the neighborhood should desire to form a company for the purpose of manufacturing and furnishing the light, then the company will sell its plant and the right to use the system or systems of light production and distribution which it may control at a fair paying price to itself, but also on such reasonable terms as would enable a purchasing company to carry on the business with the best prospect of making it a highly remunerative one. If, however, there was no desire to form such a local company, the American Electric and Illuminating Company would prosecute the business as a branch of its own.

The company does not seek to organize local companies, but prefers in all cases to demonstrate that electric lighting by their system can be conducted on a large or small scale with satisfaction to the consumer and profit to them. In some cases, however, owing to legislative grants and charters, they have been compelled to consolidate their interests with those of local organizations, in all of which their relations have been entirely satisfactory.

Since their organization they have put in operation their now celebrated central lighting station in the Massachusetts Mechanics' Charitable Association building, on Huntington avenue, Boston. The situation of this building is excellent, and affords the opportunity of extending from its central location wires in all directions at a minimum of cost, as no long distances will have to be traversed to get to any part of the city. In this station are twenty Thomson-Houston generators, with a capacity of five hundred lights. These dynamos are run by a Wheelock engine of 150-horse power; two Wing rotary engines, one connected direct and the larger one by belt to two dynamos; and two of the now celebrated Armington & Sims engines, that run perfectly two 25-light dynamos each.

The business has grown so rapidly since it was established that there are now, in all, about three hundred lamps supplied with electricity from this center. Seventy-five of these lamps are in the Fair building and five outside it. In the Winslow skating rink, on Clarendon street, there are ten lights, and one on the outside. Seventy-five lamps are on the streets, and the balance in stores, warehouses and factories. The longest circuit at present supplied is about eight miles, but there is no reason why a circuit double that distance could not be successfully and economically operated with this system of lighting.

The local company at Hartford, Conn., with the assistance of the parent company at Boston, have made great progress, notwithstanding the strenuous efforts of the gas companies to defeat their purposes, and now have two engines of the Armington & Sims make, driving four dynamos of a combined lighting power of 200,000 candles, enough to light the city satisfactorily. At Fitchburg, Mass., under the management of M. Lee Ross, the company have put in a plant of about the same capacity, and, as a guarantee of the success and economy of the system and management, it is now, after only five weeks' operation, paying its expenses. The Lowell company has been a success from its inception, and pays a revenue into the company's treasury. Mr. H. M. Stevens, who was formerly superintendent of the construction department in Boston, is now manager of the Lowell branch, and to his application and industry much of the success is due. The system in the central station is the same as that adopted in Hartford. An Armington & Sims engine drive two generators of twenty-five light each. This "series" system is the best we have yet seen so far as results are concerned, and believe it should be generally adopted in plants of one hundred to five hundred lights. There are two of these "series" of fifty-lights each in the Lowell central station. Mr. Strianes has the management of the newest operating plant which was inaugurated so successfully in Providence, R. I., on May 12th. That this branch of the

parent company will find its proper place at the head of the electric lighting business in Providence, no one who knows the public sentiment of approval with which it was received, will care to dispute.

The company is organized and chartered under the strict and exacting laws of Massachusetts, and has a capital of $1,000,000 in shares of $10 each. Mr. Edward H. Goff is president; Hon. Silas Gurney, vice-president; Mr. C. D. Smith, treasurer, and Mr. Samuel Elder, secretary, with an efficient corps of assistants of whom Mr. Edward J. Welsh, the electrician of the company, is deserving of special mention for his faithful services. To the efforts of President Goff, however, is due the eminent success of the organization in all its details and to his honorable business methods of giving the country one of the best arc lights in existance at the least possible cost is the credit largely due.

## Electricity as a Motive Power.

By Prof. George Forbes.

The subject of the transmission of power by electricity has been so often discussed that I have had some difficulty in selecting the point of view from which I should look at the subject to-night. I presume that most of my audience have seen the action of a current which was generated by one dynamo acting upon another dynamo so as to cause it to rotate. I presume that they have also seen such a motor driving a circular saw, or a fan, or a sewing machine. They may also have heard of the grand possibilities among which the imagination delights to revel, on the realization of which we shall look back on the old life without electricity as being but one step removed from barbarism. I propose to myself something more humble, but perhaps, for all that, quite as useful. That is, to discuss the results which have been already attained, and to show what steps are immediately possible with the knowledge and experience now at our disposal. I will not weary you with descriptions of machines, nor refer to their relative merits. In quoting the performance of any special machine, it will not be so much on account of its merits as because it may have come more especially to my notice in connection with the particular subject which I may be talking of.

Of course, from the moment that Oersted discovered the action of a current on a magnet, it was known that energy could be transmitted to great distances by a wire. The energy which is put in at one end of a telegraph cable is partially reproduced thousands of miles away, in the form of mechanical movement. But what we have to consider is the condition of using a current to supply motive power to drive machinery. In what cases is such an application practicable, in what cases is it economical, in what cases convenient? I wish to give you, this evening, an answer to these questions, and to explain what has been done and is being done in this field: how far we can build on past experience, and how far we are justified in foreseeing steps in the future.

When new discoveries are made, we are distrustful of them; but we are too often, also, apt to be over-sanguine. We dive, in our imagination, into the future, and conceive that that immediately will be accomplished which experience ought to warn us can only be the result of many decades of labor.

Let me give you an example. We are constantly hearing at present of a certain method by means of which water-power, it is said, will be extensively used. This is to use it in charging accumulators with electricity, and then to carry the accumulators on a tramway or railway, and use them to drive the wagons. At first sight this seems very feasible, but reflection makes us pause. The same water-power has been always available; it might have been used to compress air; compressed air tramcars have been constructed, and, in my opinion, are a perfect success. This method of application of the water-power is much simpler than by the electrical accumulators. But it has not yet been tried, and hence we cannot hope that this method of using electricity is likely to be very soon introduced.

From the time that it was known that a current of electricity, in going through a wire round a rod of iron, converts the iron temporarily into a magnet, inventors have been at work trying to utilize this knowledge in the construction of motors. The chief difficulty lay in the very short distance through which the attraction of a magnet remains powerful. There was also, in the motors of old date, a difficulty of getting over the dead points. The length of pull of a magnet may be considerably increased by various devices. A somewhat similar action may be effected by utilizing the suction of the current through a coil or wire upon a rod of iron. A coil of wire with a current through it acts as a magnet. One end of it attracts the N end of a magnet. But the coil also magnetizes a rod of soft iron placed in this position, and having magnetized it, it attracts it.

This principle has been utilized directly to obtain power from electricity. The most interesting application of it which I have seen, was at the Electrical Exhibition at Munich last year. That exhibition was especially of interest owing to the various applications of electricity as a motive power, and I shall have occasion to refer to it more than once. The machine to which I now refer is designed by M. Deprez, and is called an electrical hammer. It is intended to perform the same functions as a steam-hammer. It consists of a vertical tube containing a short rod of iron, and surrounded with a coil of wire. The wire at each turn is led away to a contact piece on a plate with a movable switch. By this means, the current passes only through fifteen turns of the wire. But there are one hundred turns of wire altogether, and by moving the switch you can pass the current through any fifteen you please. You suck the iron into one section, and then move the switch, and so raise the center of attraction. In this way you suck the iron up to the top of the tube, and then you can equally well drive it down, with the force of suction added to the weight of the iron. The weight of the iron was 80 lbs., the height of the tube one meter. I can illustrate the principle with this model. He used a current of about 36 amperes; 31 amperes was found sufficient, when passing fifteen times round, to support the weight of the iron. The length of the iron rod was about six times its diameter. This is equivalent to saying that, in such a coil, a current of one ampere must circulate (15×30), or 13,500 times, to support the iron rod in the center. I tried independently with this small coil, which has three layers of 43 turns each (129 in all), and I found that five amperes were required to support the iron in the center. From this result one ampere would have to make 16,200 turns in place of 13,500, as Deprez found. I give these data because they help to fix our ideas, and numerical measurements in magnetism are far more scarce than in electricity.

Dr. Werner Siemens used the same principle in the construction of a motor to be driven by electricity, though I need hardly say his invention was not derived from the one just mentioned. It will readily occur to you that the electrical hammer of M. Deprez might, by a simple modification, be converted into a reciprocating motor, like the piston of a steam engine, and so it might be used to drive a fly-wheel and machinery But in this mode of applying it, the whole of the momentum of the iron mass would be lost at the end of each stroke. The same is true of the piston of a steam engine. But in the rotary engine it is not the case. Now, although the rotary engine is not so economical as other steam engines, its principle serves to lead us from the electrical hammer of M. Deprez to the beautifully ingenious electric motor of Dr. Werner Siemens.

If we suppose the tube with the coil of wire round it to be bent round into a circle, the iron cylinder being also bent into an arc of a circle, then, by changing the points of contact for the current to pass through the coils, we could suck the iron core round and round inside the circular tube. This is the principle employed by Dr. Werner Siemens in the elegant motor which he has lately produced. The inner iron core is made in the form of a complete ring, but only a certain arc is of iron, the rest being of brass. It rests on wheels, spaces being left in winding the coils for these supports to reach the central ring. In the actual machine, the points of contact for the current to enter and leave the coils are changed automatically by the rotating ring. In such a form of motor, the magnetism of the iron is never changed or destroyed, and this diminishes largely the waste of energy by heating during magnetizing and demagnetizing, which is so serious an objection to most motors—I think I might safely say, to all other motors.

If this form of motor were used to drive machinery, it is easy to see that, instead of making contact automatically, it would be quite easy to do so by hand, simply turning a handle round; and by doing so more or less rapidly, the speed of the machinery might be regulated by a boy with most perfect facility. It could be quickened, slowed, stopped, or reversed by the simple process of turning the handle. I consider that there will be a great demand in the future for such a form of motor. I will give one example. I am sure many of my audience will sympathize with me when I speak of one of the horrors of a sea voyage, I refer to the terrors of the steam-winch. What traveller has not spent sleepless nights under the constant influence of the whirring and jarring of that dreadful engine when stowing or discharging cargo. For many years I have felt convinced that this was a field for the application of electricity as a motive power. But for a long time no scheme suggested itself to me which was perfectly satisfactory. In fact, it was not until I saw Dr. Siemen's motor that I felt satisfied that the thing could be accomplished. I have no hesitation in saying that such a motor, with the contacts made by hand in the manner I have described, will be a very perfect machine, and very much more easily managed than the present steam-winch, with its troublesome combination of valves and brakes of multiplying and reversing gear. When such machines are introduced, life on board ship will be a different thing.

Now, I am not going to spend time to-night in describing all the different motors which have been invented. Most motors now in use are simply generators of electricity used in a different way. Many years ago, after a prolonged absence from England in the Pacific I was writing to the late Professor Clerk Maxwell, and asked him what had been going on in science during my absence. His answer was, "the greatest discovery of late years is that a Gramme machine can be reversed." He saw that this must be a more perfect type of electro-motor than any previous one, and that now there was a real future for employing electricity as a motive power. The Gramme machine was a cheap generator of electricity, and was an efficient motor. The problem was solved, and only required development. Of course, Professor Clerk Maxwell's remarks would have applied to any other of the modern generators. I am not going to trouble you with a description of these machines; their construction is known to most of you. It suffices to say that, when one machine is turned so as to give a current, it can drive another machine at a distance.

Now let me say a few words about the convenience of electrical motors. We are certainly a long way from having electricity laid on to our houses like water, which we may use for any purpose we please. But when it is laid on, it is certain that many people will use it, because they now use water engines, although water is very expensive, and because electric motors would be far more convenient in many ways. But in a large factory the only methods available for distributing power is either by shafting or by steam pipes. Both of these are objectionable in many ways, and the convenience of having only to lead wires to the different places where power is required will in time become manifest to many of our manufacturers. This remark applies more especially to donkey-engines and steam-steering apparatus on board ships; and I confidently look forward to electricity being largely used for the light work on steamers, and this before any long time. Of course, special attention will be given to see that the compasses are not affected by the powerful magnets and currents used for these purposes.

It is found that, to get any good effect, an electric motor must run at a high speed. In this there is a great difference between the the theory of electromotors and of steam engines. If a steam locomotive were restrained from running down an incline by the pressure of steam on its piston, the steam would be doing no work, and no power would be used up, except by a slight condensation. But if an electric locomotive were to perform the same office, it would be using up the current all the time, and yet not performing external work. When, with the electrical hammer, the iron cylinder is supported in the tube by the electric current, power is being used up, and yet no external work is done. It is the same as with muscular exertion. This introduces us to a new factor in mechanics—the cost of the statical effort. When I support a weight, I am using up muscular energy, and yet I am doing no external work.

But there is one peculiarity in electric machines of great importance. The motor is also a generator. Thence it follows that, when it is in motion it creates an electromotive force. This tends to produce a current of electricity in the circuit, going in the opposite direction to the one which is driving the motor. The intensity of this opposing force is directly proportional to the velocity of rotation. If the generator and motor were identical, and the work done by the motor was so far reduced as to allow it to rotate nearly as fast as the generator, then the opposing electromotive force would almost be equal to that of the generator, and there would be hardly any current in the circuit. But if a brake be put upon the motor, more work is done, and the current in the circuit increases. The maximum amount of work is got from a motor in this way when the counter-electromotive force is equal to half that of the generator. The greatest efficiency (or return) is obtained when the counter-electromotive force is nearly equal to that of the generator. Some persons have argued from this that we ought to run motors with very light loads for the sake of economy. This is not the case. If the motors were run so as to do only half of the maximum, we should require twice as many motors, and usually the prime cost of the motors is too great to cause this to be economy. The efficiency of a generator for electric lighting or other purposes is highest when there is a very high resistance in the circuit, but electricians, as a matter of fact, nearly always work their dynamos up to their maximum capacity, although this is by no means the most economical so far as the efficiency is concerned.

I have said that, to produce a good mechanical effect with a dynamo used as a motor, it is necessary to drive at a high speed. This speed is generally too great for ordinary mechanical applications. For example, we do not require the wheels of a tram-car to turn at anything like a speed of 800 turns a minute. In such applications, then, it becomes necessary to reduce the speed by suitable gearing. Thus, in the electrical tramcars which have been constructed hitherto, belting has been used, or some equivalent. This is an awkward expedient, and one which, in practice, is found to give much trouble. I am inclined to think that in making an electrical railway, it would be preferable to make the wheels of small diameter and attached directly to the axle of the motor. This seems to be by far the best plan in the present state of affairs. It may be that a motor will be found which will work economically at a lower speed; but with those which are now at our disposal, it would be best to work with very small wheels.

We now come to consider, directly, the

transmission of energy to a distance. There are two separate kinds of application. One is to fixed motors, the other to locomotives. Let us begin with the stationary motors. There is no doubt that if electricity be capable of transferring the water-power of rivers to the centers of mechanical industry, if it be capable of introducing economy by burning coal at the pit mouth, or the bottom of the pit shaft, then we have a vast engineering industry ready to open out.

It is not until we have sat down and worked out from experimental data the cost of installation and maintenance, that we can pronounce an opinion on the merits of such schemes. When we want to send a large quantity of energy to a distance, through a thin wire, we must use the highest electromotive force which we consider safe, and the most powerful current which the conductor will bear without either fusing or injuring its supports by heating, and then we have no means of increasing the amount of energy which we can send, except by increasing the size of our conductors. Unfortunately, when we double the weight of our conductors, we do not double the current which we can pass through them.

Hence there must necessarily be a limit to the quantity of energy which can be sent along a single line, which limit is reached when the cost of the conductor becomes too great. When a limit is thus attained, the only way of increasing the transmission of energy economically is by increasing the number of systems of conductors, or else by introducing means of cooling the conductors. These are the considerations which have guided M. Deprez in his experiments. But Sir William Thompson has shown that the loss of horse-power in heating the conductor more than compensates for the expense of thicker conductors.

For economy, we ought to have the value of horse-power thus wasted equal to the value of interest and deprecation of conductor.

In such an installation we require to consider not only the quantity of power which can be transmitted, but also the efficiency of the arrangement.

Now, the efficiency varies with the quantity of power which is transmitted. If we transmit very little energy, we get a high efficiency, nearly $=1$; if we transmit the maximum amount of energy possible, the efficiency is $\frac{1}{2}$. In fact, the work done by the motor is proportional to the efficiency, minus the square of the efficiency—

Where $w = 4M(e - e^2)$.

$M$ = the maximum work possible.

$e$ = the efficiency.

$w$ = the actual work returned.

And consequently, when the efficiency is nearly equal to unity, the work done is zero.

It is found in practice to be preferable to get nearly the maximum work out of a machine rather than to increase the size and cost of the machines, in order to get a certain amount of work from the apparatus.

## New District Signal Box.

The object of this signal box is to enlarge and open a new field to the present district service.

The box is placed in some convenient locality accessible to a number of persons; as, for instance, at certain street corners in towns and villages and even cities upon the poles of the telegraph companies and from thence connected with an office of the company, it being expected the system will be found most useful when used in connection with some of the present telegraph or district systems.

The signal box has an iron casing with two receptacles. Upon opening the door of the upper receptacle access is given to the calling instrument and to a slit connected with the lower receptacle.

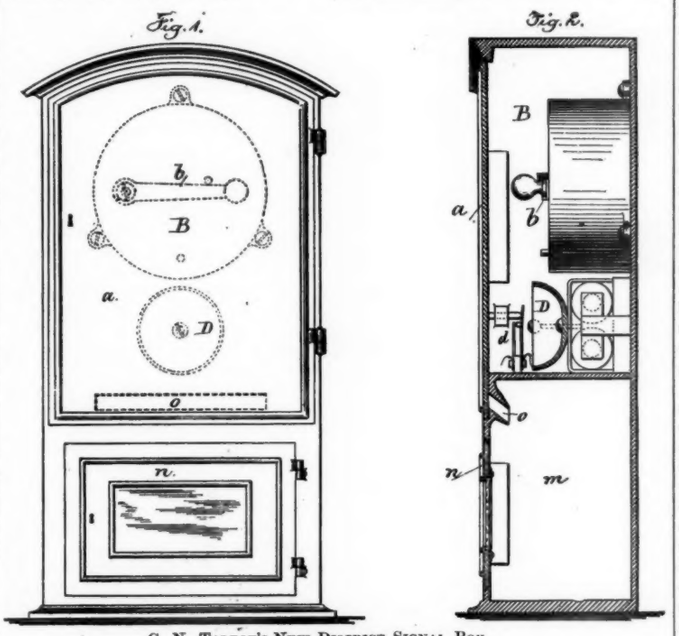
The party after sending the call and upon receiving the return answer, drops into the lower receptacle by means of the slit a card containing his name and address, and stating whether it is a messenger, carriage or express wagon which is desired, and then closing the door returns to his house. At the receiving office as soon as it is known what is wanted—a carriage we will suppose in this case—the driver being supplied with a key to the lower receptacle, is at once sent to answer the call, and the driver upon arriving at the box opens the lower receptacle and taking the card proceeds at once to the address designated.

A messenger can be called in the same manner to take a telegram. The box being to the telegraph office what the letter-box is to the Post-Office.

The box can be placed in the hallways of large buildings, giving without the expense of placing a box in each office district service to all the tenants.

It is not intended for localities in large cities where boxes are placed in every house and office free of cost to the subscriber, and only actual services charged. But there are many districts, even in cities where it does not pay to place boxes in houses free, and where there are parties who while they would gladly use and willingly pay for actual messenger service, cannot afford to pay rentals.

The box does not supplant the present system of district service, it simply enlarges it and opens fields which now are not occupied. It is to be used in connection with and as an adjunct to the present system.




C. N. Talbot's New District Signal Box.

## A History of Electric Telegraphy to the Year 1837.

By J. J. Fahie.

Among the many flights of imagination by which genius has often anticipated the achievements of her more deliberate and cautious sister, earth-walking reason, none, perhaps, is more striking than the story of the sympathetic needles, which was so prevalent in the 16th, 17th and 18th centuries, and which so beautifully foreshadowed the invention of the electric telegraph.

This romantic tale had reference to a sort of magnetic telegraph, based on the sympathy which was supposed to exist between needles that had been touched by the same magnet or loadstone, whereby an intercourse could be maintained between distant friends, since every movement imparted to one needle would immediately induce, by sympathy, similar movements in the other.

As a history of telegraphy would be manifestly incomplete without a reference to this fabulous contrivance, we propose to deal with it at some length in the present chapter.

For the first suggestions of the sympathetic needle telegraph we must go back a very long way, probably to the date of the discovery of the magnet's attraction for iron. At any rate, we believe that we have found traces of it in the working of the oracles of Pagan Greece and Rome.

Thus we read in Maimbourg's "Histoire d'Arianisme:"

"While Valens (the Roman Emperor) was at Antioch in his third consulship, in the year 370, several Pagans of distinction with the philosophers who were in so great reputation under Julian, not being able to bear that the empire should continue in the hands of the Christians, consulted privately the demons, by the means of conjurations, in order to know the destiny of the Emperor, and who should be his successor, persuading themselves that the oracle would name a person who should restore the worship of the gods. For this purpose they made a three footed stool of laurel in imitation of the tripos at Delphos, upon which having laid a basin of divers metals they placed the twenty-four letters of the alphabet round it; then one of these philosophers, who was a magician, being wrapped up in a large mantle, and his head covered, holding in one hand vervain and in the other a ring, which hung at the end of a small thread, pronounced some execrable conjurations in order to invoke the devils; at which the three-footed stool turning round, and the ring moving of itself and turning from one side to the other over the letters, it caused them to fall upon the table and place themselves near each other, whilst the persons who were present set down the like letters in their table-books, till their answer was delivered in heroic verse, which foretold them that their criminal inquiry would cost them their lives, and that the Furies were waiting for the emperor [he was subsequently burnt alive by the Goths] at Mimas, where he was to die of a horrid kind of death; after which the enchanted ring turning about again over the letters, in order to express the name of him who should succeed the emperor, formed first of all these three characters, TH E O; then having added a D to form THEOD the ring stopped, and was not seen to move any more; at which one of the assistants cried out in a transport of joy, 'We must not doubt any longer of it; Theodorus is the person whom the gods appoint for our emperor.'"

If, as it must be admitted, the *modus operandi* is not here very clear, we can still carry back our subject to the same early date, in citing an experiment on magnetic attractions, which was certainly popular in the days of St. Augustine, 354 to 430.

In his "De Civitate Dei," which was written about 413, he tells us that, being one day on a visit to a bishop named Severus, he saw him take a magnetic stone and hold it under a silver plate, on which he had thrown a piece of iron, which followed exactly all the movements of the hand in which the loadstone was held. He adds that, at the time of his writing, he had under his eyes a vessel filled with water, placed on a table six inches thick, and containing a needle floating on cork, which he could move from side to side according to the movements of a magnetic stone held under the table (pp. 718 9 of the Basileae Ed. of 1522).

Leonardus (Camillus), in his "Speculum Lapidum," &c., 1502, *verlo magnes*, refers to this experiment as one familiar to mariners, and Blasius de Vigenere, in his annotations of Livy, says that a letter might be read through a stone wall three feet thick, by guiding, by means of a loadstone or magnet, the needle of a compass over the letters of the alphabet written in the circumference. ("Les Cinq Premiers Livres de Tite Live," Paris, 1576).

From such experiments as these the sympathetic telegraph was but a step, involving only the supposition that the same effects might be possible at a greater distance, but when or by whom this step was first taken it is now difficult to say. It has been traced back to Baptista Porta, the celebrated Neapolitan philosopher, and in all probability originated with him; for in the same book in which he announces the conceit, he describes the above experiment of St. Augustine, and other "wonders of the magnet," adding that the impostors of his time abused by these means the credulity of the people, by arranging around a basin of water, on which a magnet floated, certain words to serve as answers to the questions which superstitious persons might put to them on the future. He then concludes the 21st chapter with the following words, which, so far as yet discovered, contain the first clear enunciation of the sympathetic needle telegraph: "Lastly, owing to the convenience afforded by the magnet, persons can converse together through long distances." ("Magiae Naturalis," p. 88. Naples, 1558.) In the edition of 1589 he is even more explicit, and says in the preface to the seventh book: "I do not fear that with a long absent friend, even though he be confined by prison walls, we can communicate what we wish by means of two compass needles circumscribed with an alphabet."

The next person who mentions this curious notion was Daniel Schwenter, who wrote under the assumed name of Johannes Hercules de Sunde. In his "Steganologia et Stenographia," published at Nurnburg in 1600, p. 127, he says: "Inasmuch as this is a wonderful secret, I have hitherto hesitated about divulging it, and for this reason disguised my remarks in the first edition of my book, so as only to be understood by learned chemists and physicians. I will now, however, communicate it for the benefit of the lovers of science generally." He then goes on to describe, in true cabalistic fashion, the preparation of the two compasses, the needles of which were to be made diamond-shaped from the same piece of steel, and magnetized by the same magnet, or, rather, magnets, for there were four, (1), Almagrito; (2), Theamedes; (3), Almaslargont; (4), Calamitro; which imparted south, north, east, and west-turning properties respectively to the needles. The compass-cards were divided off into compartments, each containing four letters of the alphabet, and each letter was indicated by the needle pointing from one to four times to the division in which it stood. Thus the letter C would be indicated by three movements of the needle to the first division of the card. The needles were actuated by bar magnets, or chadids, and attention was called by the ringing of a tiny bell, which was so placed in the way of the needle that at each deflection of the latter it was struck, and so continued to ring until removed by the correspondent.

The next and most widely known relation of the story occurs in the "Prolusiones Academicae" (Lib. II., prol. 6), of Famianus Strada, a learned Italian Jesuit, first published at Rome in 1617, and often reprinted since. Although the idea did not originate with Strada (for he seems to attribute it to Cardinal Bembo, who died about 1547), he was certainly, as Sir Thomas Browne quaintly says, "the *aeolus* that blew it about," for his "Prolusiones" had long been a favorite classic, while the particular poem referring

to the lodestone has, if we may say so, been continually going the rounds of the newspapers. It is quoted, more or less fully, in many authors of the seventeenth and eighteenth centuries, famous amongst whom are Hakewill ("An Apologie or Declaration of the Power and Providence of God in the Government of the World," 1630); Addison (*Spectator*, No. 241, 1711, and *Guardian*, No. 119, 1713); Akenside ("The Pleasures of Imagination," 1744); and "Misographos" (*The Student; or, The Oxford and Cambridge Miscellany*, 1750).

The references to it in the present century are simply too numerous to mention. The following is the latest English version:

"There is a wonderful kind of magnetic stone, to which, if you bring in contact several bodies of iron or dial-pins, from thence they will not only derive a force and motion by which they will always try to turn themselves to the bear which shines near the pole, but also, by a strange method and fashion between each other, as many dial-pins as have touched that stone, you will see them all agree in the same position and motion, so that, if by chance one of these be observed at Rome, another, although it may be removed a long way off, turns itself in the same direction, by a secret law of its nature. Therefore, try the experiment, if you desire a friend who is at a distance to know anything, to whom no letter could get. Take a flat, smooth disc; describe round the outside edges of the disc stops, and the first letters of the alphabet, in the order in which boys learn them, and place in the center, lying horizontally, a dial-pin that has touched the magnet, so that, turned easily from thence, it can touch each separate letter that you desire. After the pattern of this one construct another disc, described with a similar margin, and furnished with a pointer of iron—of iron that has received a motion from the same magnet. Let your friend, about to depart, carry this disc with him, and let it be agreed beforehand at what time, or on what days, he shall observe whether the dial-pin trembles, or what it marks with the indicator. These things being thus arranged, if you desire to address your friend secretly, whom a part of the earth separates far from you, bring your hand to the disc, take hold of the movable iron, here you observe the letters arranged round the whole margin, with stops of which there is need for words, hither direct the iron, and touch with the point the separate letters, now this one, and now the other, whilst, by turning the iron round again and again throughout these, you may distinctly express all the sentiments of your mind.

"Strange, but true! the friend who is far distant sees the movable iron tremble without the touch of any one, and to traverse, now in one, now in another direction; he stands attentive, and observes the leading of the iron, and follows, by collecting the letters from each direction, with which being formed into words, he perceives what may be intended, and learns from the iron as his interpreter. Moreover, when he sees the dial-pin stop, he, in his turn, if he thinks of any things to answer, in the same manner by the letters being touched separately writes back to his friend.

"Oh, I wish this mode of writing may become in use, a letter would travel safer and quicker, fearing no plots of robbers and retarding rivers. The prince, with his own hands, might dispatch business for himself. We, the race of scribes, escaped from an inky sea, would dedicate the pen to the Shores of Magnet."

## How Cable Messages are Received.

Until the fore part of November the French cable, having its terminus at North Eastham, Mass., employed the flash system of signaling. Now the cable is worked duplex on the Sterns system, says the *Journal of the Telegraph*, using an automatic recorder, by which the messages are received in ink on a narrow strip of paper.

By the system which has been displaced the messages were spelled out by flashing a ray of light back and forth across a standard line, the right and left flashes corresponding with the dots and dashes of the ordinary telegraphic alphabet.

In this system the light is flashed by reflection from an extremely light mirror, which is turned to right and left by the opposing influences of positive and negative impulses. This system has the advantage of being operated with very slight electric impulses, but also the disadvantage of leaving no permanent record.

To secure the latter very important end the recording instrument has been adopted. The press dispatch announcing the change states that in the new recorder the ink is discharged by the agency of electricity and "not by capillary attraction, as in other cable recorders." This statement is incorrect, electricity being now similarly employed in the recording instruments used at Heart's Content, the Newfoundland station of the Anglo-American Company's cables.

A recent visitor to Heart's Content describes the method of receiving messages at that point. The recorder is a horseshoe magnet, electrified by the usual circles of fine wire, and attracting a small metallic coil. The coil is hung between the magnetic poles, and by a light lever and a thread almost as fine as the strand of a cobweb is connected with a delicate siphon hung in a little reservoir of ink. The ink is electrified, so as to produce a repulsion of the particles, making it flow more readily through the siphon, which outside is about the size of a darning needle, and the interior tube scarcely larger than a hair. The lower end of the siphon rests against a paper tape playing perpendicularly through rollers. The whole machine is almost of gossamer fineness and flexibility, so as to minimize the electric strain necessary for working the cable.

Let us imagine now that a coming message has been signaled from far across the ocean at Valentia. The operator at first opens the simple machinery that works the brass rollers. On the center of the tape, as it passes between the roilers, the siphon at first marks only a straight line. Suddenly the line swerves to the right or left. The message has started, and the end of the siphon has begun its record. Worked by two keys, and positively or negatively electrified, the coil swings the siphon point now to one side, now to the other, along the tape. Responsive to the trained hand of the operator, the filament of ink marks out one notch, two notches, three notches; then suddenly it may be a high elevation or depression, until the delicate line traced on the tape looks like the tiny outline of a mountain range.

But it is a range whose every hill-top, peak and valley means an alphabetical symbol to the telegrapher's eye. The recorder is the invention of the famous electrician, Sir William Thomson. How delicate an interpreter it is may be inferred from the fact that ten jars work 1,800 miles of cable between Valentia and Heart's Content, while twenty-five jars of the same electric power would be needed to work 350 miles of land wire; in other words, the recorder is more than twelve times as efficient for its purpose as the ordinary Morse instrument. The recorder traces its character on the tape about as fast as a slow penman copies a letter. Besides its delicacy of work, the recorder, as its name imports, has the merit of leaving the record of the message.

## Luminosity of Magnets.

By J. T. Sprague.

Recent experiments by Prof. W. F. Barrett, of Dublin, will direct fresh attention to the statements made many years ago by Baron Reichenbach, which have hitherto met with little or no acceptance from the scientific world. A great number of people have, however, felt that Reichenbach's statements were too definite to be altogether set down as delusion, and that there must be some truth, possibly important, behind them. Reichenbach declared that magnets emitted from their poles a faint luminosity, which became perceptible to eyes which had been kept in absolute darkness for some hours. This in itself makes the experiment difficult, as absolute darkness is not easily obtained, nor are there many observers willing to be confined in it for many hours at a time; but this is certainly necessary, as any one may discover for himself that the eye retains luminous impressions for many hours, and, therefore, would need absolute rest for a considerable period in order to appreciate such a faint luminosity as that under consideration.

But Reichenbach went a great deal further than this, as he declared that a similar luminosity surrounded the human body, and was also generated by the electric current and by crystals; he attributed it to an unknown force or fluid, which he named od or odic force, and he contended that this force was essentially linked to vital and other actions. His great difficulty lay, however, in the fact that this light was not only very difficult of perception at all, but that it could only be perceived in any case by a particular class of observers, called by him "sensitives."

Now, this class of sensitives coincided with another class, viz.: those in a somewhat unhealthy nervous state, and more distinctly with hysterical young women. Therefore, the subject at once passed into the domain of "mesmerism," and was presented to the English public by that very clever but exceedingly extravagant mesmerist, Dr. Ashburner. As a consequence, the scientific world regarded it as a mere matter of charlatanism, or, at most, a piece of hysterical delusion.

Even those who know the truth about mesmerism, and its relation to the occult mysteries of the nervous system, and who were willing to believe that Reichenbach's observations were probably opening a road to useful knowledge, had a great difficulty to encounter. I have myself gone through these experiments, and, moreover, I have found "sensitives" who saw all these phenomena, not in darkness, but in faint light. If this seems difficult, it should be remembered that nowadays we can see, and even photograph the faint light of the solar prominences, and even of the invisible corona which formerly were only visible in a total eclipse: something similar underlies my own statement possibly. But my difficulty was that I could never satisfy myself that what my observers said they saw was in actual existence. I was satisfied they actually saw what they described: my doubt was whether the sight was *objective*, an action exerted from without upon their optic nerve; or whether it was *subjective*, a vision produced from within, by the influence of my own knowledge of what was to be expected.

Now, Prof. Barrett appears to have got over this difficulty. He employed a powerful electro-magnet under the control of observers in another room, and, after a considerable time in darkness, his two "sensitives" perceived a luminosity, and led him up to the magnetic poles; the current was afterwards made and broken at irregular intervals, unknown to the observers, who, in every instance except one, simultaneously observed the appearance and disappearance of the glow. It is important to note that, as with Reichenbach, only the specially qualified observers—the sensitives, were able to see the phenomena, which appear to have been imperceptible to Prof. Barrett himself, and three other gentlemen in the room with him. This matter is explainable, and will be dealt with presently.

The north pole of the magnet was said to be the brighter; in the older observations a difference of tint was noted. In both cases it was found that blowing on the poles caused the light to waver, but the laying a board or cloth on the poles did not affect its development, which, however, was arrested when the armature was placed on the magnet.

Although I have never been able to attain proper scientific proof, I have always thoroughly believed that Reichenbach's statements were honestly true; that the observers perceived real natural phenomena, and that the time would come when they would play an important part in science, and probably reveal some valuable secrets of health and the nature of life. I have always been convinced in my own mind that these luminous appearances over magnet poles were simply representations of the aurora emanating from the magnetic poles of the earth.

One of the early experiments consisted of an iron globe containing an electro-magnet which presented the appearance of a luminous body with an aurora of prismatic colors flowing from each pole toward the equator, at some little distance from the surface. It has always seemed clear to me that the aurora was a magnetic light and not an electric one. Its rays run north and south, while the electric earth currents run mainly east and west.

In an aurora, magnetic disturbances are produced and also strong earth currents; if the aurora were an electric discharge it should produce induced currents parallel to itself, but it does not. Lines in that direction are but slightly influenced, while strong currents are produced in lines at right angles, as they should be if the auroral rays indicated a fluctuation in the magnetic intensity of the earth, produced either by direct magnetic influences or consequent upon the circulating currents themselves.

My object in writing this article is to clear away some difficulties and prejudices which are likely to affect future observers, and also the reception of their statements. I return, therefore, to the appearances said to surround the human body. My observers described me (as did Reichenbach's) as surrounded by an aura, having a pink tinge on one side and a blue tinge on the other, with brighter rays proceeding from the head and hands; in fact, the image presented was just that of pictures of the Transfiguration. Now, as I said berore, I am quite uncertain whether this appearance was a real phenomenon, perceptible only to special persons, or whether it was a mere vision resulting from the faculties possessed by those special persons. *But that we are surrounded by such an aura is a positive fact known to all of us.* It is invisible to the eye, but the thermometer reveals it. *It is an aura of heat;* it is a mass of warm arm; it is *radiant energy*. Now here is the key of the ideas I wish to present.

We know that from every source of light we can generate a spectrum consisting of three parts, only one of which, the middle portion, the luminous spectrum, is perceived by our eyes But after all we do not see with our eyes, any more than we photograph with a camera. These are merely mechanical appliances for transmitting radiant energy to the true sensitive agent, which, in the case of sight, is ultimately the brain. Now, different kinds of glass or crystal modify profoundly the transmission of radiant energy to the sensitive plate and enable different parts of the spectrum to affect it; also different kinds of receiving plates would give entirely different records of the same spectrum transmitted to them. It is precisely so with our eyes and our perceptions; some people are unable to perceive some colors or perceive them as others. There is every probability that different people do not see the same luminous spectrum; that to some it extends further to the right, to others to the left. In fact, to some people orders of rays are visible, which are invisible to others.

Now, Reichenbach asserts that his odic force is refrangible and belongs chiefly to the violet end of the spectrum.

We must remember that in his time it was fully believed that there were three distinct forces present in light, which were sifted out in the spectrum; therefore, it was reasonable for him to suppose that he had discovered a new force, "Od," associated with heat, light and actinism, and playing a very important part in nature in those departments hitherto least understood, because this force had not been recognized.

It is equally reasonable for us now to believe that in the magnetic field and in many other actions, ultra-violet, *fluorescent* rays are produced, and that these fluorescent rays may, in some cases, be perceived as light by people having abnormal powers of organs of perception.

In fact, I have long ago suggested that the auroral rays are of the fluorescent nature, and that they are not visible directly as light, but that they, when at a particular intensity, or when undergoing changes of intensity, act upon the gases and moisture in the upper regions of the atmosphere, and become visible by fluorescence, thus generating lines in the spectrum not associated with any known substance. There can be no doubt of the interest attached to the subject, and various branches of knowledge have progressed so far as to enable us to examine it now with every prospect of advantage, provided it is examined in a broad manner, and with an eye to the physiological problems involved, as well as the purely physical ones. Prof. Barrett knows something of these various aspects of the subject, and will, no doubt, attend to them in further experiments.—*English Mechanic.*

# Telephonic.

### Telephone Meeting.

The annual meeting of the stockholders of the Suburban Telephone Company was held in Lowell, the 28th ult., 2,055 shares being represented. The treasurer's report which covered a period of eight months that the company has been under the present management, showed that there were 520 sub-cribers Sept 1, 1882, and 1302 connected May 1, 1883, an increase of 782 or nearly 100 per month. The average increase for the last two months exceeded 100 monthly, and the prospects are good for this rate of increase during the year 1883. Exchanges are being established in every important city and town within a radius of twelve miles of Boston, and orders have been filed for a large number of summer stations at the beaches the coming season. The company have paid two dividends, amounting to $15,750, and has a surplus of $2795.50. The old board of officers were re-elected as follows:

President, W. A. Ingham; treasurer and clerk, Charles J. Glidden; general manager, Loren N. Downs; directors, W. A Ingham, Charles J. Glidden, Loren N. Downs, A. G. Pollard of Lowell, and Charles F. Morrill of Manchester, N. H.

### Telegraph or Telephone.

Despite the fact that recent experiments have demonstrated the possibility of telephoning over long circuits, it is to be doubted if the instrument will be used otherwise than locally. It is too sensitive to induction, to atmospheric electricity, and to grounds for circuits exceeding a few miles in length. The experiments have been tried under the best, not under the worst conditions, and through a complete metallic circuit—in other words, a double line. It is hardly possible for the telegraph business of two large cities to be conducted by telephone by the senders of messages themselves, for five hundred wires might not suffice to prevent a block in busy hours, and merchants could not and would not wait.

To operate telephones as the telegraph is now used would be equally impracticable. Even were the instruments as little liable to disorder as the Morse, the greater danger of errors would weigh against them. There is no system of signals as clear as the present Morse code as interpreted by the "sounder." Each letter of a word is given, and ordinarily good operators seldom err in the record. By telephone it is the sound of a word, and not its vowels and consonants, which the operator receives, and a mistake can easily happen even under the best conditions. It is to be doubted, too, if the rapidity of transmission by telephone, where the messages had to be written down at the receiving station, would even approximate that of the Morse system. Proper names, scientific terms, and phrases in a foreign language, &c., would have to be carefully spelled out, and even then would fall wide of accuracy.

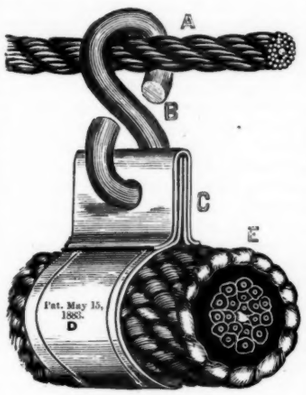
By the Morse system good operators will receive at the rate of forty-five words a minute, which is almost the limit of rapid pen manship, and will often take a 2,000-word message without once interrupting the sender. The lines, too, will work in the heaviest weather, and are only interfered with by serious electrical storms, or by actual accident to the wires. Again, by the quadruplex system, four messages can go at once over one wire, while the long-distance telephone requires two wires for one message. All in all, there seems to be but little prospect of the present series of experiments resulting in a practical good, however gratifying from a scientific standpoint.—*N. Y. Sun.*

### A Telephone and Telegraph Company.

The certificate of incorporation of the People's Telephone and Telegraph Company of New England was filed yesterday. The capital stock is fixed at $3,000,000, with power to increase it to $10,000,000. Frank Jones, James P. Cook, H. M. Cross, and Ernest Marx are the corporators.

### Wright's Cable Clip.

This is a simple device for hanging telephone, telegraph and other cables, easily adjusted in any position wherever ærial wires to be hung in numbers or series. A glance at our illustration and the accompanying description will show the many excellencies of this invention.




A, represents the guy wire.

B, S-hook with the upper end turned to the right to allow hooking easily upon the guy wire.

C, Water-proof cap, also operating as a clamp in securing the clip on the cable.

D, The clip band, flanged at the ends to prevent injury to fibrous or other coverings of all kinds of ærial cables.

E, Fibrous or other coverings for cables.

The clip is made of plate zinc, and manufactured in sizes to hold cables of 15 to 25; 25 to 50, and 50 to 150 wires. Special sizes are made to order. The following directions explain fully the operation of this device Put up the guy wire or wire rope taut and secure; fasten the clips on the cable every two feet, or a little less. Pass the hooks through the clips all the same way, and close them firmly with line pliers, at the same time close up the cap snugly by giving it a smart pinch on each side of the hook with the pliers. Make fast your out haul rope and station a man at the first out hitch; hook the cable on the guy by cramping it slightly to the left, continue this until the cable is run out as far as you wish. If the hooks are the proper size for the guy rope they cannot unhook so long as you keep the cable reasonably taut, but can easily be unhooked by taking up a little slack in the cable by cramping it to the left.

Mr. Wright's invention was patented May 15th, and is approved by Hon. Henry Howard, President Providence Telephone Company, Mr. Henry B. Lytle, Manager Boston Telephone Dispatch Co, Mr. John W. Duxbury, Superintendent, and Mr. Alexander McClellan, Chief of Construction of Providence Telephone Co., Holmes Burglar Alarm Co., Providence and American Electric Works of the same city, all of whom have made practical tests of the efficiency of this clip. It is also used by the Suburban Telephone Co., Boston, the Southern Telephone and Telegraph Co., of New York; National Capital Telephone Co., Washington, D. C., and the Bell Telephone Co. of Montreal, Canada This device is the invention of the patentee, Mr. Augustus Wright, of Providence, Rhode Island.

### An Electric Bell Used as a Telephone Receiver.

[From the English Mechanic.]

Whilst adjusting an ordinary trembling electric bell a day or two ago, and noticing a point where the armature was attracted slightly by the electro-magnet, but insufficiently to break contact, it occurred to me that the instrument in that condition would probably act as a receiving telephone. I accordingly arranged a rough-and-ready microphone, which, together with a watch, I placed in an upper story. The microphone was then included in circuit with the electric bell and a couple of cells on the ground-floor. On placing the wooden case of the bell against my ear I plainly heard the ticking of the watch. Having succeeded so far, it seemed of interest to ascertain if speech could be heard as well as the ticks of a watch Only a partial success was, however, obtained in this case, for although a faint high pitched utterance was heard, the words spoken could not be distinguished. With singing and the sound of a musical box the result was more successful Had a good transmitter been at hand, the results would no doubt have been better, but as it was there was a good deal of jarring in the receiver. No attempt was made to improve the result by altering the position of the armature of the bell. I may mention that I tried two bells, and obtained a much better effect with one than the other. Also, that a low resistance transmitter gave a better result than one of high resistance.

Here, then, is an old electric instrument constructed prior to the days of Reis' telephonic experiments, which, together with a still older piece of apparatus—viz, a galvanic battery and a bad connection in the circuit, affords all the necessaries for transmitting and receiving even vocal sounds from a distance.

I do not suppose the idea of using an electric bell as a telephone receiver to be altogether new after all the attention which this subject has received of late, or to imply that there is anything in it which might not have been expected; but you may think the experiment worth publishing in your interesting periodical.

LEIGH S. POWELL.

A correspondent in Auckland writes: Our exchange system is gradually extending. In Auckland we have 150 subscribers; Wellington, 50; Christchurch, 125; Dunedin, 225. In Auckland a young lady does the switching, but in the other places males perform that service.

A Newark (Ohio) dispatch announces the arrest, at that place, of W. S. Bowman, on a requisition from the Governor of Illinois, charged with embezzling $800 while manager of the Central Telephone Company's exchange at Lincoln, that State.

The *Telegraphers Advocate*, a bright and interesting little semi-monthly journal, has just made its appearance among our exchanges

If its future editions are as good as its first, it will be a very valuable paper to telegraphers. It is edited and published by Messrs. Taltavall & Mitchell, 76 Cortlandt street, New York. We wish them success.

Hudson has been connected by telephone with Adrian giving them both a through connection with Detroit, Jackson and all points centering at Detroit. A line from Adrian to Toledo, O., via Blissfield, will soon be completed.

### Baggs and the Telephone.

"Are you goin' along this way? What's your name, anyhow?" Officer Baggs asked suddenly.

"Why, my name's Miss Central; don't you know me? I have charge of the main telephone office."

"Oh, do you?" Officer Baggs asked, and then fell in a deep reverie. He soon took to biting his lips, and crimson spread over his face. At the same time he looked askance at the pretty girl.

"Look here," said he, presently; "I didn't know they had girls in that office."

"But they do—in all the offices."

Officer Jim Baggs' confusion visibly increased. "Did you chance to be in that office," he asked, "the other day when a burst of profane swearing, mingled with the wail of a strong man's anguish, floated over the wires?"

"Well, now," said the lovely girl, "it happens so frequently; really you must be more particular. Perhaps I was there."

"I'm sorry," said Jim Baggs, earnestly; "but on one of them frekent occasions I was the depraved monster at the off end of the wire. I tackled the hellocination you have charge of one day in the stationer's, an' I made a modest request to be switched into Johnson's restaurant. The restaurant set up a helloing, an' I requested 'em to do up a beefsteak thick an' rare, with pertatoes, coffee (milk separate), and Injin cakes. The reply came, 'I am the pastor of the Baptis' Church, and think there must be some mistake.' I got the eatin' house helloing once more, an' I started in again on my little bill of fare. I had got far enough to describe the shade of brown I'd like put on both sides of the pancakes when my astonished ear caught the remark, 'Central, shut off that case of famine, will yer, and let me hear from my friend Biles!' The people in the stationer's set up a laugh as I began a third time with the outlines of the supper I wished to have ready when I got down to the restaurant. I got to where the milk came separate from the coffee, when I was advised that I had left that much of the order in a law office. Well, Miss, I landed that bill of fare first in one corner of the town and then —an' then—an' finally you or somebody else said wouldn't I please settle on who and what I wanted, an' not be interrupting the whole business of the city. Then for a moment, Miss, my reason fled, and if you'll remember I asked you if you wouldn't kindly tell the eatin' house to plug up their machine, and I'd drap around an' tell 'em what I wanted, and ended, as you remember, Miss, by asking you if you wouldn't oblige me by going to Florida with your central office, and be hanged to you, or words to that effect."

"Oh, yes," said the beautiful woman, "I do remember that. Oh, you needn't apologize; that was nothing to what I catch every day; positively nothing. Here's my corner; good day."—*Washington Capital.*

Young Politician writes: "Why does a State have a legislature?" My dear boy, it doesn't. The legislature has the State, every time. Has it by the throat, by a large majority. Has it by the pocket-book. Has it on its back. You bet your slippers, young man, the State never has the legislature.—*Burdette.*

The certificate of incorporation of the New York and New Jersey Telephone Company was filed with the Kings County Clerk on Saturday last, its object being to construct telephone lines along all railroads, canals, rivers, bridges, highways, and streets in the States of New York and New Jersey, and in every village of the State, and between private and public buildings of the villages, and to connect all points with each other and with all telephone centers in the United States. The capital is fixed at $50,000, but may be increased to $20,000,000. The incorporators are Charles F. Cutler and Joel C. Clark of South Framingham, Mass., Charles A. Nichols of Springfield, Mass., Morris F. Tyler of New Haven, and Alexander Cameron of Brooklyn.

*Editor Electrical Review:*

SIR: I want one of those pretty electrical engines and battery of M. Trouve's figured in your issue of April 26 as driving a boat. Can you give me the firm's address or that of their agents? You would greatly oblige me by doing so.

Electricity is furnishing light for several of our big Mississippi boats, and we will soon be up with the age. Weston is going to run wires in Memphis and Little Rock, and Brush, already established, is waiting for storage batteries and Swan lamps. Edison don't seem to thrive here. Some day somebody will fit the arc light for domestic use, and there will be a crash in stocks. Ten years ago I lit my parlor with two Chester cells and a small Ruhmkorff coil very well—but then I had but one light.

Respectfully yours,

C. P. LEAVITT,

179 Second street, Memphis, Tenn.

ANSWER:

[Send to Western Electric Co., No. 62 New Church street, New York City.]

# Electrical Review,

FORMERLY REVIEW OF THE

Telegraph and Telephone.

Published Weekly at 23 Park Row.

P. O. BOX 3329.

GEO. WORTHINGTON, Editor. THOS. H. DELANO, Publisher.

SUBSCRIPTION.

United States and Canada, $3.00 per annum, in advance.

Great Britain and other foreign countries, $4.00, in advance. Postage free.

ADVERTISING.

Transient rate, 25c. per line each insertion.

"Business specials," 35c. a line.

EDITORIAL ANNOUNCEMENT.

Address all communications and make all checks and P. O. orders payable to order of Delano and Company, Proprietors. P. O. Box 3329, New York.

*We invite correspondence from Electricians, Inventors and the Telegraph and Telephone fraternity on matters pertaining to electrical and scientific subjects, and all facts of special interest in connection therewith.*

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From whom copies of the paper can be procured.

The Montreal News Company, Montreal, Canada.
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NEW YORK, JUNE 7, 1883.


CONTENTS.


| | PAGE |
|---|---|
| The Coming Electrical Exhibition at Vienna | 1, 2 |
| Electrical Units of Measurement | 2, 3 |
| Miscellaneous Electrical News | 2 |
| American Electric and Illuminating Company, of Boston | 3, 4 |
| Electricity as a Motive Power | 4 |
| A New District Signal Box | 5 |
| A History of Electric Telegraphy to the Year 1837 | 5, 6 |
| A Cable for Sale | 6 |
| How Cable Messages are Received | 6 |
| Telephonic News | 6 |
| Wright's Cable Clips | 6 |
| The Electrical Exposition | 6 |
| Anent Transatlantic Cables | 8 |
| The Time Telegraph Company | 8 |
| The Inventor and the Public | 8 |
| Electrical Notes | 9, 10 |
| Our Mexican Letter | 9, 10 |
| New Electrical Patents, etc. | 10 |
| Manufacturing News Items, etc | 11 |


## The Coming Electrical Exposition.

If the expectations of the projectors of the coming International Electrical Exposition at Vienna—of which an illustration of the edifice in which it will be held is given upon our title-page—are not too sanguine, the most complete collection of electrical contrivances yet brought together will doubtless be the result.

The scheme devised by the gentlemen having the matter in charge will commend itself not only to a public anxious to know the truth regarding the relative values of the several apparatus for lighting, propelling, &c., but also to those inventors who possess something of real commercial value.

There will, we understand, be no indiscriminate distribution of prizes, as in most if not all the exhibitions which have preceded it, and this determination of the managers to refuse their official countenance to contrivances of questionable utility indicates on the part of these gentlemen the possession of more than ordinary good judgment if not of common honesty.

The evils which arise from the indiscriminate distribution of "honors" cannot be over, estimated. Fraud and charlatanry are encouraged, and the unsuspecting public is led into snares and pitfalls by the very men whom it had relied upon to protect its interests.

To encourage persons with electrical apparatus and contrivances to contribute toward the success of their exhibitions, the English especially have been in the habit of awarding medals, presumably for excellence to every person who brought with him a costly or interesting plant, regardless alike of the practical value of such exhibit or the scheme by which, with this as an allurement, he proposed to hoodwink the public. As an evidence of how far the English carry this thing the following example will suffice:

At a recent exhibition of manufactured goods in London medals were distributed from a hand-basket. On the eve of the closing of the exhibition, the committee on awards having completed its labors was about to disband, when to its consternation they discovered men carrying baskets filled with packages of tobacco running hither and thither in the crowd crying: "'Ere's yer hextra fine terbacker—on'y terbacker in the hull hexerbition what didn't get no prize!"

The intention of the projectors in the coming electrical exhibition in Vienna is, if we have been correctly informed, most commendable. Though each of them has been chosen by reason of his knowledge of electrical matters, no preference in regard to choice of position or conveniences for outstripping his fellows are to be granted, even to those electricians who, up to the present time, have stood highest in the public estimation. On the contrary, all exhibitors are to stand upon the same footing. That is to say, the unknown man, who has never, owing to his obscurity or modesty or lack of influence will, in the coming exhibion, be permitted to present his designs to the public upon the same footing with him that is wont to attract the public gaze with flaunting placards and catch-penny announcements. And when the exhibition draws to a close, awards of merit are to be made only to those who have shown their apparatus capable of performing that which has been promised for it, and where this performance is original, unique and of practical value.

We hope the coming exposition will fulfil the promise of its spring.

## Anent Transatlantic Cables.

The successful working of the American transatlantic cables has caused, naturally enough, great satisfaction in this country. It is pleasant to think that the prosperity of the country and the increase of its wealth are sufficient to warrant the undertaking of an American enterprise outside the United States. It is not many years since we were obliged to look abroad for capital to construct our home railroads and to float our Government loans. To day, not only have we the means at our command to construct our new railroads and work our new mines, but we are able to go abroad and seek new countries to conquer.

The recent enterprises in Mexico, although possibly, to some extent, fated to prove disastrous to those who have invested in them, are evidence of the growth of wealth, which seeks some outlet. The American Cable Company is another proof of our wealth and enterprise. Ever since that famous day of hope and dismay, when the first cable transmitted a few congratulatory messages and then became silent, the construction of cables across the Atlantic has been due to foreign capital and foreign skill. It is true that the cable of the American Company was manufactured in London and laid by an English ship, but the sinews of war were American. Over this progress we cannot but be rejoiced, but there is some bitterness in our cup of happiness when we reflect that this cable has been laid by the arch-speculator of Wall street.

The laying of this cable did not recommend itself to Mr. Gould's mind from any patriotic or philanthropic motives. It is well known that the cables now in working order can send more than twice as many messages as are now sent. The Anglo-American Company has four cables across the Atlantic, and the Direct Cable Company has one. These five cables are fitted with the duplex apparatus, so that the two English companies can send ten messages at one time. Then there is the French Cable Company, with one cable. That these cables can easily do all the business between Europe and America is beyond doubt, and the promoters of the American cable must not try to hoodwink the public by any suggestion that their cable is needed for the transmission of messages.

We must, therefore, seek elsewhere for the reasons which have influenced Mr. Gould and his colleagues in laying the new cable. Two motives will at once suggest themselves to persons familiar with telegraphic business and Wall street. The first is that the promoters of the new company are anxious to reduce the rates by starting a healthy competition. Unfortunately this suggestion will not hold water for a moment, for, long before the Gould cable was laid, its promoters were in negotiation with the foreign party upon the subject of amalgamation. The other motive which may have influenced the promotors, who are all notorious stock speculators, was that they might, by means of a wire, over which they had entire control influence the foreign stock markets, and by getting early news make turns in the market. The stock exchanges of London and New York would be thus bound together by an unfailing band, and Mr. Gould would have the same power in Capel court that he has for some time wielded in Wall street.

Mr. Gould's cable boom, however, didn't boom as was expected. No sooner did he make the attempt to set it going when the press of the country—that safety-valve of the public—sounded the warning. The result was that the laying of a new cable was threatened, whereat Mr. Gould was compelled to desist, and should he ever again make such an attempt, capital is at hand to lay a dozen cables if necessary to prevent its success.

## The Inventor and the Public.

We have upon several occasions spoken in strong terms of these projectors, so-called, who endeavor to thrust upon an indiscriminating public articles which are of a questionable value, or sell stock in a company whose excuse for existence consists in a something from which much success is expected but little already attained. We do not wish, however, to be understood as condemning all those who are prophesying great future success for that which is yet in a state of embryo. On the contrary, there are many worthy persons now working dilligently and intelligently upon electrical apparatus, which though to the casual observer seems of but doubtful promise, may in the future develop into a great practically commercial success. Such persons deserve the consideration and the sympathy of their fellow men.

Unfortunately, however, it has always been the practice of mankind to judge of actions by the event. The same attempts, conducted in the same manner, but terminated by diffcrent success, produce different judgments; they who attain their wishes never want celebrators of their wisdom and their virtue, and they that miscarry are quickly discovered to have been defective not only in mental but in moral qualities. The world will never be long without some good reason to hate the unhappy; their real faults are immediately detected, and if these are not sufficient to sink them into infamy, an additional weight of calumny will be superadded. He that fails in his endeavors will not, in the minds of the inconsiderate, long retain either honesty or courage.

This species of injustice has so long prevailed in universal practice that it seems likewise to have infected speculation; so few minds are able to separate the ideas of greatness and prosperity that a well-known authority has determined that "he who can deserve the name of a hero must not only be honest but fortunate."

By this unreasonable distribution of praise and blame none have of late suffered oftener than projectors of electrical enterprises, whose rapidity of imagination and often vastness of design raise such envy in the breasts of their fellow mortals that many eyes watch for their fall, and many hearts exult at their distresses. Yet even a projector may gain favor by success, and the tongue that was prepared to hiss then endeavors to excel others in loudness of applause.

Those who find themselves inclined to censure new undertakings, only because they are new, should consider that the folly of projection is very seldom the folly of a fool. It is commonly the ebullition of a capacious mind, crowded with variety of knowledge and heated with intenseness of thought. It proceeds often from the consciousness of uncommon powers, from the confidence of those who, having already done much, are easily persuaded that they can do more. When the scheme of forcing coal gas through street mains was first broached in London it was jeered at; when the projectors of the transatlantic cable talked about transmitting messages between two continents three thousand miles apart, they were set down as idiots. Yet all succeeded.

On the other hand, successful men, in whom the public has great confidence, not infrequently disappoint their patrons. Thus when Rowley had completed the orrery, he attempted the perpetual motion; when Boyle had exhausted the secrets of vulgar chemistry, he turned his thoughts to the work of transmutation

## The Time Telegraph Company.

An important acquisition has been made by the Time Telegraph Company, in the absorption of the time service operated under the patents and able management of Mr. James Hamblet, from the Western Union Building.

Mr. Hamblet now assumes the position of general superintendent of the Time Telegraph Company, whose headquarters are in Temple Court.

The Time Telegraph Company could not have made a better appointment for the place, as Mr. Hamblet is an acknowledged authority on all such matters as come in his department.

It is gratifying to see every telegraphic enterprise succeed, for in the success of all worthy efforts in the telegraphic field the craft generally is benefited.

From our knowledge of the character of its officers and the liberal policy to be pursued, we were impressed with confidence in this company from the first.

But the wonderful development and growth of this enterprise has far surpassed the expectations of its friends, and the item above noted strengthens the company for still greater success.

# Electrical Notes.

Few persons outside of the telegraph and newspaper office are aware of how important a factor the telegraph has become in the make-up of the journals of the day.

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The mail editor is no longer of any consequence on the staff of a great journal, while the correspondent is being gradually suppressed.

***

The collector of telegraphic news is the great contributor, and editing is merely arranging, condensing or elaborating the messages which come over the wires, and making such editorial comments as are suggested by the news of the day.

***

The high price of telegraphing which obtained here in America limited the amount of specials, and the *Herald* was the first paper to show that costly news by cable was a good investment.

***

A journal which up to a very recent date was owned by Jay Gould has been publishing telegraphic letters from St. Louis and Chicago. It also enjoyed some exceptional privileges from railways controlled by the same person, for getting into the various cities ahead of its rivals.

***

But this is only a small part of the telegraphic work in the newspaper.

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An immense amount of matter is daily telegraphed to the Associated Press of New York City, and every large journal receives special telegrams of from two lines to two columns from all parts of the country, and almost every Sunday columns of special cable news may be found within their pages.

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Nor are the daily journals alone in their desire to lay before their readers at the earliest possible moment.

***

The ELECTRICAL REVIEW set an example to its scientific contemporaries that they would do well to emulate.

***

As an example of this, the English scientific journals are at the present time publishing the remarks made by Dr. Norvin Green, of the Western Union Telegraph Company. Yet, if the files of the ELECTRICAL REVIEW are referred to, it will be seen that that journal published here in New York a verbatim cable report of this speech the day after it was delivered in London.

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When Jay Gould first secured the control of the Western Union Telegraph Company, the press was warned that he would use his position to help journals in which he was specially interested and injure all others.

***

As is well known, however, at least two of these, viz., the *Herald* and *Times*, had the courage to declare open war upon this dangerous monopoly.

***

The laying of a new cable was planned and arrangements were as good as perfected, of forcing him to take his hands off from the telegraphic news.

***

It has been alleged that our papers are not so interesting now as when the correspondent and the mail reader occupied so much more space than they do in the journals of today.

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In regard to this, much may be said on both sides.

***

We get the news, it is true, with a completeness never known before, but its presentation is more common-place, and to a certain extent less interesting.

***

The telegraphic agent, it is said, cares nothing about style or rhetoric. He must stick to facts stated concisely; he must not elaborate or give details, and yet it is in these very points that much of the interest in the news consists.

***

The fact that the body of a young girl had been found thrown up in some distant beach would create in itself no special interest; but when love, murder, and mystery are hinted at, every detail is demanded by an insatiate public.

***

But, on the other hand, while a record of dry events, however important, can never create the keen public interest which is found in every well told story, with a humorous or pathetic point, or associated with some mysterious crime, nevertheless the public which may be said to be absolutely greedy where news is concerned, would greatly prefer the outline of a tragic story, for example, on Monday morning than to wait until Tuesday, or even Wednesday or Thursday, or perhaps a week or ten days for an elaborate account

***

It is a notable circumstance that three of the most successful newspapers in the United States—that is, successful in the way of circulation—depend to a great extent for their popularity upon the publication of a kind of news which is suppressed by the New York journals, and by respectable newspapers everywhere.

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The New York *Sun*, the Boston *Herald*, and the Chicago *Times* make a special point of publishing the details in the fullest manner of all crimes, especially those which involve the relation of the sexes.

***

Nine-tenths of this is telegraphic matter, sometimes as much as three columns being given of a single subject or occurrence.

***

The Chicago *Times*, though rarely heard of in this section, is said to spend more money in special despatches in a year than do all the other Chicago papers combined.

***

There are some cynics who think our journals are much more moral than those who read them. The owners of newspapers are generally wealthy. The editors must be fairly educated, and all the principal persons employed in the making-up of a daily paper have family or social surroundings which force them to keep their respective publications clean.

***

Then the advertising public, naturally enough, have an objection to papers that cannot circulate in families; but the immense circulations which are often secured by publications which pander to a depraved taste show that there is a large audience whose moral tone is much inferior to that of the editors and publishers who supply their journalistic wants

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The heavy sale of novels and story papers for some years past may be due to the change which has insensibly come over our daily press.

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The telegraph rarely transmits domestic news such as women like to read.

***

Telegraphic stories of love and murder give place to political news or the reports of the stock markets.

***

The foreign and domestic correspondent, with his gossip and personalities, is no longer a feature in our daily papers, while the mails are read only to verify despatches previously received. As a consequence, newspapers, while more valuable in political and business circles, are less read by women and young people

***

The tornadoes, which have become so numerous and so destructive of late years, have aroused much serious thought and speculation as to their cause.

The floods also, and, generally speaking, the entire revolution of the natural forces from their heretofore consistent and uniform course, tend in the same direction.

The astronomers explain them on the theory that they are the result of the disturbances and storms taking place on the sun

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Perhaps this theory is correct; still, it is only a theory, and it may be wide of the truth.

***

Wars of the elements are not strange and wonderful things that pertain to this age only, but their alarming frequency and terrible destructiveness go to show that the forces producing them now are both different in character and of much greater power than in past times.

***

May not the causes be found here?

The earth is now believed to be a vast reservoir of electricity.

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It cannot, however, be said to be a vast reservoir at rest.

***

It is in constant motion.

***

Its equilibrium is being continually disturbed, and as continually being re-established again.

***

The work performed by it in the meantime, while in transit, is enormous in extent.

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Its power, or possibilities, are even yet but faintly understood.

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May not this force or power have much to do with our physical laws; and if it has, why may not the explanation looked for be found here?

***

The earthquakes, floods, tornadoes, etc., follow as a natural sequence from the sudden and numerous changes that are so steadily being produced in the balance of power, so to speak.

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It has been said that the borders of wonderland were brought almost within reach in the endeavor to trace this unknown energy to its source.

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Perhaps the borders have been already reached, nay, passed, and we are now inside the boundary line.

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What will be the ultimate result? Who can foretell?

The stars look like arc lights; the sun itself may be likened to one of enormous size; and when the earth becomes illuminated with them, the whole universe will be in harmony.

***

A barber was injured at a game of base-ball in Waterbury, Conn., by the grand stand giving way. He was talking at the time, and the weight of his opinions proved too much for the structure.

***

The Metropolitan Telephone and Telegraph Company, of New York City, have 3,500 subscribers connected.

***

A Boston beauty who repeats everything she hears is called "a belle telephone."

## Our Mexican Letter.

PUEBLA (MEXICO), May 14, 1883.

*Editor of the Electrical Review.*

DEAR SIR,—On the assumption that a better acquaintance with a sister republic is always desirable, I beg to submit a faint idea of the progress of the telephone in that portion of it covered by the States of Puebla, Tlaxcala, and Hidalgo, which States are being operated by this company. The demands made by the City of Puebla have been so great that we have, as yet, done but little else than establish agencies in the two remaining States.

We began operations in August, 1882, by procuring that which is most necessary to the success of any enterprise in this country, *i. e.*, the sanction of the Government, in the shape of a fifty-year concession. We found the people slow—oh, so terribly slow that patience was well-nigh exhausted, when a bright thought struck us—we must study the disposition of the people; we must educate them in the use of the novelty. How should we do this? By adding to their ease. We thereafter had no trouble, for having satisfied them that they could transact a large portion of their business through the phone, they were not slow to appreciate its worth, and, as before stated, have given us so much encouragement as to overburden us. Our central office opened for business September 1st, 1882, with five subscribers, two miles of wire, and no poles. On May 1st, there were connected and working with the central office one hundred and fifty subscribers, requiring seventy-one miles of wire (fourteen steel). Our switch is the Davis & Watts; wires are run in cables from the cupola to the window, thence through cleats to the switches. We also use the Western electric pole-changer, which is operated by the closing of an O. C. burglar-alarm spring, which operates one cell of Leclanche battery. One of these springs is placed in the floor, in front of each section of switch, the operator has only to step on it when pressing down the calling button. This is a saving to apparatus and battery, and does away with the annoyance of the continual vibration of the instrument. Our central-office connections average about three hundred per day, requiring the services of two operators, whose time is arranged to cover from 8 A. M. to 12 midnight. At this writing, we have constructed six private lines, planted five hundred poles, and have a total of one hundred miles of wire in operation. The rental charged for connection with the C. O., for any distance not exceeding one kilometer, is five dollars per month. Our first trunk line to San Martine, distant thirty-seven kilometers, will be completed by June 1st. San Martine is on the shortest route to the City of Mexico, distant ninety kilometers, to which latter point we contemplate building or extending our line in a short time, and eventually, in a north-easterly direction, to Vera Cruz. That these lines will be immensely popular and profitable there can be no doubt, judging from the cry of the people, who, having learned the worth of the telephone, are not slow to see the advantages to be derived therefrom.

Working under a fifty-year concession from the State Government, telephonic material of every description admitted to the State free of duty, urged on by Congress, who (having met all our requests favorably) plaintively ask, "Can we do anything more for you?" A valuable Government contract for fifty years; this company has one of the most valuable plants in the republic.

It is astonishing how little is known of this country, its people, and its climate, in the States. You who think of us as exiles, suffering from fevers, threatened with revolutions, living in mud huts, &c., &c., relieve your minds at once and picture, if you can, a city of stone houses, two stories in height, 7,072 feet above the sea level, lying in the lap of and surrounded on three sides by snow-capped mountains, air always dry and cool, thermometer never varying more than ten degrees (averaging 65° throughout the entire year), well paved streets in a state of cleanliness never approached by New York; a city of churches and feast-days. Why wonder that for an age it has been called "Puebla de las Angeles" (village of angels)! and, best of all, a growing disposition on the part of the eighty thousand inhabitants to awaken from their long slumber and at least give the foreigner a cordial welcome.

I am quite sure we have nothing to complain of. True it is that they are exasperatingly slow—who wouldn't be in such a climate?—we Americans are no laggards in this respect; 'tis so supremely delicious, this reclining in an easy-chair in the heat of the day, watching the smoke as it curls from your San Andres cigar, fanned by cooling breezes from the mountains, lulled to sleep by the song of birds such as Mexico only can

produce, I confess to a growing disposition to admire that which I frowned upon in the beginning. Then, too, we have our music in the Plaza, our theaters, our beautiful señoritas, whose eyes bore great holes in a fellow's heart. Already two of my men have succumbed. Manager C. H. Basset and Superintendent C. T Downham are no longer open to engagements, but have closed with two Mexicans, and will swear their lives away on June 1st. *Quien sate* who will go next? W. E. HUNTINGTON.

## Telegraph Operators.

(From the Cleveland Herald.)

While a *Herald* reporter was sitting behind the railing of a large telegraph office yesterday, listening to the ceaseless clatter of the instruments, he ventured to ask a youthful manipulator of lightning if he had been long on the line. The youth straightened up and replied:

"'Bout five years."

"Must know all the boys on the line?"

"Yes; know 'em over the wire, if I don't any other way. Lots of 'em I never saw, but when they take hold of the key and begin to call I know who they are."

There is no more interesting feature of the telegraphic service than the ability, acquired through practice, to distinguish between the different operators on a line by the manner of their sending. A corps of operators, each familiar with his fellow's method of sending, would scarcely need to waste time to affix their office signature to their calls, the office wanted being able to judge what operator was working the key. No operators in the city become more thoroughly acquainted and conversant with the men on their wire than those at the head of the great railroad divisions, which extend in almost every direction from the city. The manners of sending of their different men become as familiar to them as does the handwriting of his bookkeeper to the owner of a bank.

During the conversation given at the opening, a flashily-dressed "sub" bent over the table and transacted the business with an air of dignity that would have become a bank clerk. A moment later some office on the line began calling the main office, repeating the call a dozen times without signing.

"Answer f-w there," said the operator to his assistant.

"But he hasn't signed yet," ventured the new man, suspiciously.

"Yes; but I know him," explained the operator, and just then the office calling ended up with a terse "f-w."

"But can you tell all the operators on the line by their method of making a single letter?"

"No, not always by a single letter; but there are very few men on my wire that I cannot tell before they have written a dozen words. Just as one learns another's penmanship we learn each other's manner of sending. We have to get accustomed to all the different styles. Some operators start off with a hop-skip-and-jump gait and keep it up all the way through a message of one hundred words. Another will send slowly and steadily, and should he have five thousand words to transmit, he will not increase his pace. Then there are fellows who will rush in a message of six or eight words, sign, and close their key before anything short of an expert has time to get down the date. By that way we are able to distinguish between them."

While the electricity jerker was delivering himself of the above information, his ear was keenly fixed on the business of the line. He turned toward the instrument a moment, and said: "That isn't George working at M——?"

"No," said his youthful assistant. "H—— was sent down the line yesterday."

A moment later he heard another friend in an office in which he knew he was not working. He reached over to the key, called up the office, and then spelled out:

"Ain't that you, F——?"

"Es," came back the answer, sleepily; "been down to see my girl."

"I knew it was F——," said the operator; "you can never get rattled on his sending."

Operators never tire in telling the wonderful legends of their craft and the stories of their skill and achievements. One told yesterday is good and worth relating. It was during the late war, when everything was considered suspicious. A Confederate general, accompanied by an expert in telegraphy, dashed open the door of a little office on the Mississippi River, and, placing a revolver at the operator's head, told him to ask "M——." twenty miles above, if there were any gunboats there belonging to the Government. The operator was a Union man. He knew if he received a negative response the Confederates would move upon the helpless Union town of "M——." But there was no alternative. The other operator was watching him closely So he called "M——," and asked nervously if there were any gunboats in sight. There were none within fifty miles, but something in the operator's manner of sending led the receiving operator to suspect the truth. So he answered: "Yes; there are two in the bay, and from my window I can see the smoke from two others coming around the bend."

"M——" was not molested. The operator's sagacity had saved the town.

An interesting incident in direct line with this subject occurred during the recent telephonic experiments between this city and New York. While one of the instruments was being tried the wire became grounded. The Morse instrument was cut in, and the words "You are a crank," "You are a crank," were heard over and over again. The office men were for a long time undetermined to what cause to attribute the breaks. No sooner would an attempt be made to use the telephone, than the same breaks would occur again, and the same message be sent, "You are a crank." By listening attentively, old operators concluded that it was the work of some operator hired by an opposing telegraph company to thwart the experiments. Those who were unacquainted with the circumstances held to the belief that the sender was a student; but the opinion of the operators proved correct. The "bridge" was put on, the break located and found to occur between stations. It was afterward traced down as the work of an operator paid to hinder the workings of the telephone then being tried.

## Alleged Luminosity of the Magnetic Field.

Professor W. F. Barrett says: "It is well known that the late Baron Von Reichenbach claimed to have discovered a peculiar luminous emanation arising from the poles of a magnet, resembling a faint electric discharge in rarefied air."

Prof. Barrett and several other gentlemen, members of a committee appointed by the society for physical research, have been making experiments with a view to proving or disproving the existence of the alleged phenomenon. No member of the committee appears to have been able to see the emanation; but the committee did discover, in some way not detailed, a certain gentleman, Mr. G. A. Smith, and a boy, Fred. Wells, 'an assistant in a baker's shop,' who each appeared able, in a room perfectly dark to other people, to see a faint glow, like a waving cone of light, at either pole of a strong electro-magnet, and to tell, by the appearance or disappearance of this glow, when the current was turned on or off by means of a commutator in charge of several gentlemen in an adjoining room.

Prof. Barrett seems to have taken various precautions to avoid deception, conscious or unconscious, on the part of the principal actors in the affair; but it is to be hoped the committee will not rest from its labors till it has found some means of making the alleged luminosity visible, not merely to bakers' assistants and other more or less irresponsible persons, but to trained scientific observers.

There were sales in Wall street on Saturday last of the stock of the Underground Electric Cable Company, which holds patents for paper conduits for the underground wires. The purchasers, it was said, were some of the first persons interested in the Edison electric light stock speculation, and upon the report that the Edison people are seeking to get control of the patent, the price advanced from actual sales at $50 a share to $80 bid.

The paper conduits are described as impervious to water, pliable enough to avoid breakage, proof against induction, and elastic enough to allow for expansion. They are made either as tubes or as grooved strips, laid face to face with the grooves together. A. T. Batchelder, of Keene, N. H., is president of the company, and F. C. Faulkner, of Boston, is its treasurer.

## Electrical Phenomena.

THE DOME OF THE CAPITOL PRESENTS A SPLENDID SPECTACLE DURING A THUNDER SHOWER—SAVED BY A RUBBER COAT.

The storm which passed over Washington on the 21st instant was accompanied by an intense electrical manifestation. About 3.15 P. M., the atmosphere was rendered very dark by the somberness of its clouds and the heavy falling rain that dashed downward in slanting sheets. A burst of hail came with the rain, and the wind blew with great force, uprooting a number of young trees in different parts of the city The lightning struck in several places, among others, one of the old trees in the capitol grounds on the main roadway from the avenue to the capitol. The tree was shivered and blackened. A beautiful and sublime spectacle was afforded by the electric flashes around the dome of the capitol, which latter threw off the lightning as an umbrella sheds the rain. The storm passed eastwardly and southwardly, and it is probable did some damage on the lower Potomac.

There is one man in Washington who thinks a rubber overcoat is a better electrical safeguard than a feather bed. During the thunder-storm yesterday afternoon Mr. C. E. Sutherland was standing near one of the instruments in the office of the Local Telegraph and Messenger Company conversing with the manager, Mr. J. Emmner, Jr. Suddenly a vivid flash of lightning entered the house and struck the instrument, thence leaped along the wires to the back of Mr. Sutherland and was there discharged with a terrific report. For a second the gentleman was enveloped in a wreath of fiery glow. There were eight persons in the room and each one got a sound "shaking up," but was otherwise unhurt. The escape of the whole party from death seems a special providence.

Researches of some of the most distinguished German physiologists have shown with great exactitude the rate of speed with which the nerve force travels. It has been ascertained that the force moves at the rate of about 97 1-10 feet in a second. This is not a remarkable speed when it is considered that electricity travels at the rate of 12,000,000 feet in a second, and light over 900,000,000, and the earth, in its orbit around the sun, 100,000. The disparity of speed between electricity and the nervous force would seem to show their non-identity. Curious calculations have been made in regard to the comparative slow velocity of the transmission of the nervous force. For instance: the problem is asked, if a boy were born on our earth with an arm long enough to reach the sun, how long would it take for him to feel that the sun is hot? In other words, how old would this boy be before he knew that he burned his finger? *Answer:* "100 years;" because the transmission of the nervous force being less than 100 feet per second, it is easily found to be about 8,600 miles a year, or 860,000 miles in 100 years which makes it nearly our distance from the sun.—*Ex.*

In Vienna recently there was a trial made with a new accumulator which only weighed four kilometers, and after having been supplied with electricity from a battery for fifteen minutes it was attached to a Swan incandescent lamp, which burned fully seven hours.

## NEW PATENTS—ELECTRICAL—1883.

INDEX OF INVENTIONS FOR WHICH LETTERS PATENT OF THE UNITED STATES WERE GRANTED IN THE WEEK ENDING MAY 15, 1883.

277,731 Apparatus for measuring and recording electric currents; John Hopkinson, Westminster Chambers, County of Middlesex, England.

277,641-2 Bracket for electric incandescent lamps; Edward Weston, Newark, N. J.

277,640 Circuit-controlling device; Edw. Weston, Newark, N. J.

277,644 Dynamo-electric machine; Edw. Weston, Newark, N. J.

277,643 Electric lamp fixture; Edward Weston, Newark, N. J.

277,645-6 Electric lamp and holder therefor; Edward Weston, Newark, N. J.

277,628 Electric lock; Mortimer Sullivan, Brooklyn, N. Y.

277,610 Electric gas-lighting; Thomas H. Rhodes, Brooklyn, N. Y.

277,596 Electric head-light for locomotives; Flamer Ball, Jr., Cincinnati, O.

277,475 Electro-magnetic engine; Gay W. Foster, New York, N. Y.

277,519 Insulating wire for electric purposes; John J. C. Smith, College Point, N. Y.

277,588 Laying underground electric wires; Jas. Marks, Newark, N. J.

277,846 Process of manufacturing carbons for incandescent lamps; Hiram S. Maxim Paris, France.

277,569 Railway telegraphic signals; Rudolph M. Hunter, Philadelphia, Pa.

277,528 Support for electric cables; Augustus Wright, Providence, R. I.

277,445 Secondary battery; Emil Boeltcher, Leipsic, Germany.

FOR THE WEEK ENDING MAY 22, 1883.

278,076 Dynamo-electric machine; Chas. E. Ball, Philadelphia, Pa.

278,119, 278,120-1-2 Dynamo-electric machine; Geo. W. Fuller, Norwich, Conn.; 4 patents.

278,577 Device for suspending electric cables; Howard C. Root and John C. Reilly, Philadelphia, Pa.

277,900 Electric train arrester; Harry W. Carlton, Peoria, Ill

278,159 Electric pneumatic clock system; Carl A Mayrhofer, Paris, France.

278,233 Electric wire duct; John C. Goodridge, Jr., New York.

278,289 Electric conductor; Samuel D. Strohm, Philadelphia, Pa.

278,293 Electric arc lamp; William M. Thomas, Cincinnati, Ohio.

278,087 Insulating underground electric wires; Wm. M. Brisbin, Philadelphia, Pa.

278,028 Lightning rod; Augustus C. Lobdell, Chicago, Ill.

278,009 Machine for covering electric wire; Wm. Halkyard, Providence, R. I.

277,869 Microscopic illuminator; Edward Bausch, Rochester, N. Y.

278,334 Regulator for electric arc lamps; Alphonse Isidore Gravier.

278,026 Telephone transmitter; James A. Lakin, Westfield, Mass.

**A printed copy of the specification and drawing of any patent to the annexed list, also of any patent issued since 1865, will be furnished by any of the patent solicitors whose advertisements appear in this journal. In ordering please state the number and date of the patent desired.**

## Contemporary Endorsements.

We have on our exchange table each week the ELECTRICAL REVIEW. To those interested in electrical science it is an authority. To mill owners who desire timely news upon the mechanical application of electricity to their special industries, especially electric lighting, it is invaluable. We call attention to this excellent paper as it is the only strictly independent electrical journal published on the broad gauge principle in the United States. Nicely printed on good paper and handsomely illustrated, the proprietors deserve the success already attained. Published by Delano & Co., 23 Park Row, New York.—*The Woolen Manufacturer*, Pittsburgh, Pa., May, 1883.

In Japan a patent law is wanted, not to protect the inventor, but the pockets of the Japanese themselves. They believe that the impression "patented" is a token of the good faith of the vendor and of the authenticity of the article.

A telephone line is being established between Big Rapids and Newaygo; and it is expected that the middle of June will see united all the principal points between Grand Rapids, Ionia and Big Rapids.

# Manufacturing News.

### Public Apology.

The London *Railway Engineer* publishes very prominently the following handsome apology:

*To Mr. George Westinghouse:*

SIR,—I beg leave to assure you of my regret at having written and published articles in the *Railway Engineer* in the course of the past year, containing statements reflecting upon you in connection with the introduction and use of the Westinghouse brake in this country, and all which statements I hereby acknowledge to be unfounded, and I am advised they are libelous. They were not made with any malicious intention. I therefore ask you to accept my humble apology and the expression of my deep regret for writing and publishing them. I undertake to insert this apology and expression of my regret in the next and any subsequent number of the *Railway Engineer*, as you may require. You are at liberty also to insert this apology in any newspaper or periodical publication, when and as often as you may desire. And, as I wish to make the fullest reparation in my power for any injury you may have suffered by the publication of these articles, I undertake to repay to you all the costs which have been or may be paid by you in connection with the action you have taken against me, so as freely to indemnify you against them.

Yours obediently,

(Signed) LAWRENCE SAUNDERS.
Editor of the *Railway Engineer*.

March 28, 1883.

A consultation was held in this city on Saturday last between Major D. I. Heap, of the Light-house Board at Washington, General Duncan and Professor Morton, in reference to the getting up of appliances and the making of tests for lighting light-houses by electricity. The plans for illuminating the entrance to New York harbor by an electric light tower have been completed and will be submitted to the Lighthouse Board at its next meeting.

The incorporation of the Horton Chair Company of Kansas City was completed last week by the election of the following officers: Wallace Pratt, president; N. N. Horton, vice-president and treasurer; W. J. Ferrey, secretary. The directors are George H. Nettleton, N. N. Horton, Wallace Pratt and T. B. Bullene, Kansas City; C. W. Blair, Leavenworth; J. L. Barnes, Lawrence; Dr. B. F. Hippler, Fort Scott. The capital stock is $200,000 in shares of $100 each. The company will manufacture the Horton reclining car-chair, dental and surgical chairs, and other articles of furniture to which the principle employed in the car chair is adopted. Ground will be purchased and extensive shops erected immediately.

One of the most remarkable of the railway appliances on exhibition in Chicago is safety signal devices. Most of the electric and other signal systems shown are in operation, some of the companies having secured several thousand feet of space to exhibit the practical work of their system.

The Westinghouse Steam Engine Company, of Pittsburgh, will exhibit at Chicago exhibition a number of its engines, ranging in size from 4 to 14 in. cylinder. The company will also exhibit a Brush electric light, the dynamo being driven by a Westinghouse engine with 7 in. cylinder.

At the annual meeting of the E. T. Barnum Wire and Iron Works, of Detroit, the following officers and directors were elected: E. T. Barnum, President and General Manager; Philo Parsons, Vice-President; F. H. Leavenworth, Secretary; Directors: E. T. Barnum, David Whitney, Jr., Philo Parsons, F. H. Leavenworth, Charles Parsons, of St Louis.

Two Corliss engines of 250 horse-power each are building at Providence, R. I., for a company of Chinese capitalists. They are to be used in a cotton mill.

The Armington & Sims Company of Providence gives a list of its last shipments of engines as follows: American Electric and Illuminating companies at Lowell, Mass., Providence, R. I., New Britain, Ct., Woonsocket, R. I., Mass., Western Edison Electric Light Company, Chicago, Ill., and Campeache, Mexico, Providence Lithograph Company, Providence, R. I., Riverside Mills, Providence, R. I., to drive Brush dynamos.

The failure of the Levett-Muller Electric Light Company, of No. 540 West Sixteenth street, is reported, and the merchandise creditors are offered twenty-five cents on the dollar to compromise, but they are not inclined to accept the offer Mr. Levett, the president, says the merchandise liabilities are about $5,000, and the company also owes $16,000 for advances from officers. In November he claimed to *Bradstreet's* that the company was worth $25,000, of which $20,000 was in cash and accounts and $5,000 in machinery, free and clear. He now says the company had to return the money received for the sale of a branch right; that the plant is now owned by Mr. Muller, and is mortgaged for $1,000; that the company has expended all its money in experimental work; that it has assigned the patents to him, and a new company has been organized as the Levett-Muller Electric Company. The old company was incorporated in October, 1881, with a nominal capital stock of $1,000,000, which was issued for the inventions of Mr. H. J. Muller. Alexander Levett was the president, and Louis Levett, secretary and treasurer.

A company in Pittsburgh, Pa., has subscribed $500,000 for the manufacture of the Love sewing machine, a new patent, in that city.

At Collins's mills in Dracut, Mass., the old mill is undergoing enlargement, and a new one for weaving, 160x60 feet, two stories, is building.

The George R. Dickinson Paper Company of Holyoke, Mass., will build an engine room 20x30 feet, to accommodate a 300 horse power Harris-Corliss steam engine.

### BUSINESS NOTICES.

Bradley A. Fiske, Consulting Electrical Engineer, 59 Astor House. Advice to inventors, calculations, etc.

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### National Secret Telephone Company.

Notice was served on the Union Trust Company yesterday by the attorneys of J. W. Rogers and J. Harris Rogers not to deliver any of the $5,000,000 of stock of the National Secret Telephone Company held by it in trust. The stock was pooled for one year, June 2, 1882. J. Harris Rogers is the inventor of the instrument. He said last night that a bill in equity is to be presented to the Supreme Court praying for the dissolution of the Company and the appointment of a Receiver on account of alleged irregularities.

### Caution.

OFFICE OF THE ARMINGTON & SIMS CO.
PROVIDENCE, R. I. May, 12, 1883.

Having been reliably informed that various parties, more especially in remote States, are building steam engines in imitations of our, and infringing the patents granted for our improved automatic regulator, valve and crank shaft, we hereby caution the public against purchasing the same, and announce our intention to protect ourselves by legal measures against all infringement, both on the part of makers and users.

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Insulated Wire Department of Holmes, Booth & Haydens, 49 Chambers Street, New York, June 1st, 1883.

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HOLMES, BOOTH & HAYDENS.

The Southwestern Telegraph and Telephone Company controls all the American Bell telephone rights throughout the States of Texas and Arkansas. The above Company was purchased of original owners Saturday, May 19, 1883, by the Lowell Telephone Syndicate, and the business will be continued and extended under its new management. Capital, $2,000,000; par value of shares, $100. Management: William A. Ingham, President; Charles J. Glidden, Treasurer; Loren N. Downs, Gen. Manager; William H. Bent, Attorney. There are at present 2,800 subscribers, with the orders of 200 more on the Company's books. The present yearly net earnings of the Company are about $84,000, *i. e.* 8½ per cent. on capital of $1,000,000. There are to-day 23 exchanges in operation, while four more are under way. The contract of the Southwestern with the mother Company is one of the most liberal. It now has *eight years and one month to run*, during which time the American Bell Company has no participation in earnings. The average price paid for rentals is $4.67. Population is pouring into the Southwest with wonderful rapidity, as indicated by the growth of Texas, whose population in 1820 was 20,000; in 1830, 35,000; in 1840, 60,000; in 1850, 212,592; in 1860, 601,039; in 1870, 818,579; in 1880, 1,592,574. An official estimate made in May, 1881, places the total population of Texas 1,700,600. Population of Arkansas, 1880, 802,564. The Southwest purchase is the heaviest transaction yet accomplished by the Lowell Syndicate, and by them, it is looked upon as fully equal to that recently made in Minnesota and Wisconsin, prophecies concerning which are already being more than verified. The stock goes upon the market in blocks of $25,000 at $50 per share.

Fuller particulars furnished upon application to

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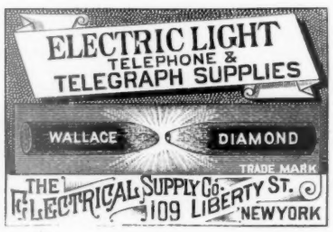


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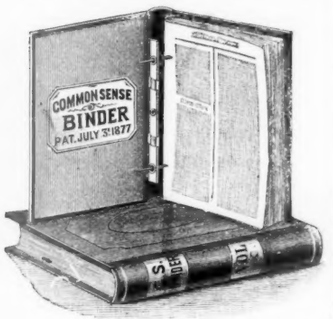


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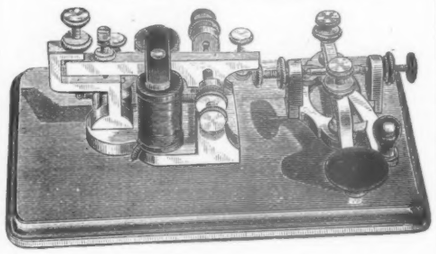

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The Commission of the International Electric Exhibition at Vienna, 1883, gives due notice to the public that this Exhibition is to take place in the course of this year, to be opened on the **1st August,** and to be closed on the **31st October,** and cordially invite Exhibitors and Visitors. The Regulations and the blanks necessary for Applications are to be had at the **Austrian-Hungarian Consuls.** The objects to be exposed will comprise all Machinery, Apparatuses and Implements connected with Electrotechnic It will certainly afford a good opportunity to inventors to show their latest improvements. This Exhibition is greatly favored by the Austrian Government, and will be held in the Rotunda of the well-remembered Universal Exhibition of 1873. Exhibitors are requested to procure the necessary papers at once.

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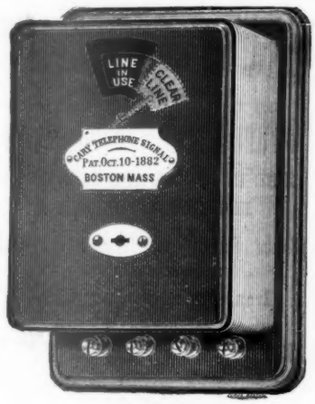


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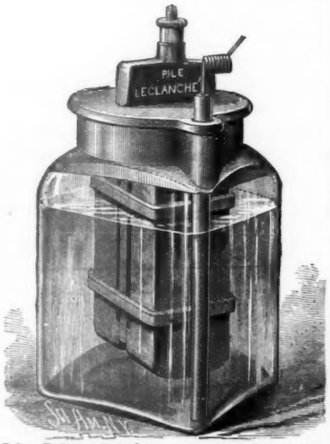


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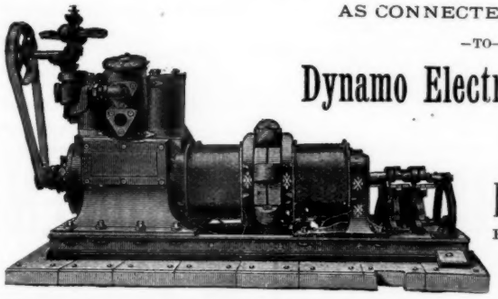

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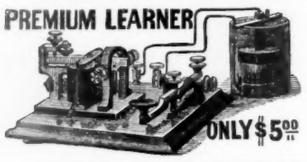


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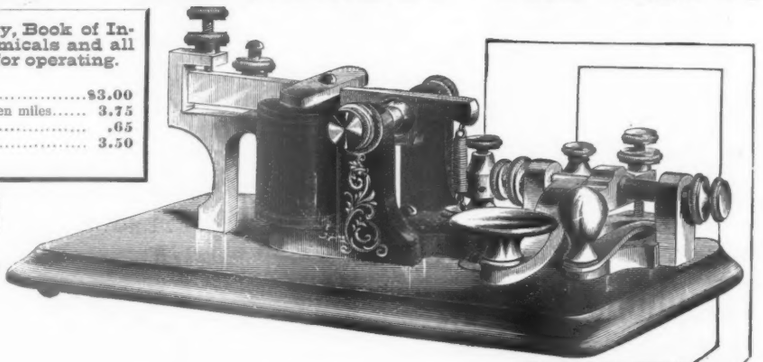

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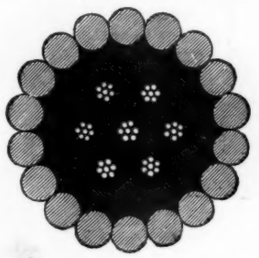

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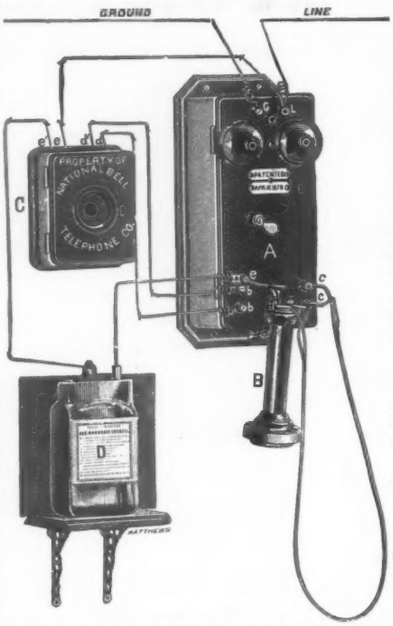


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